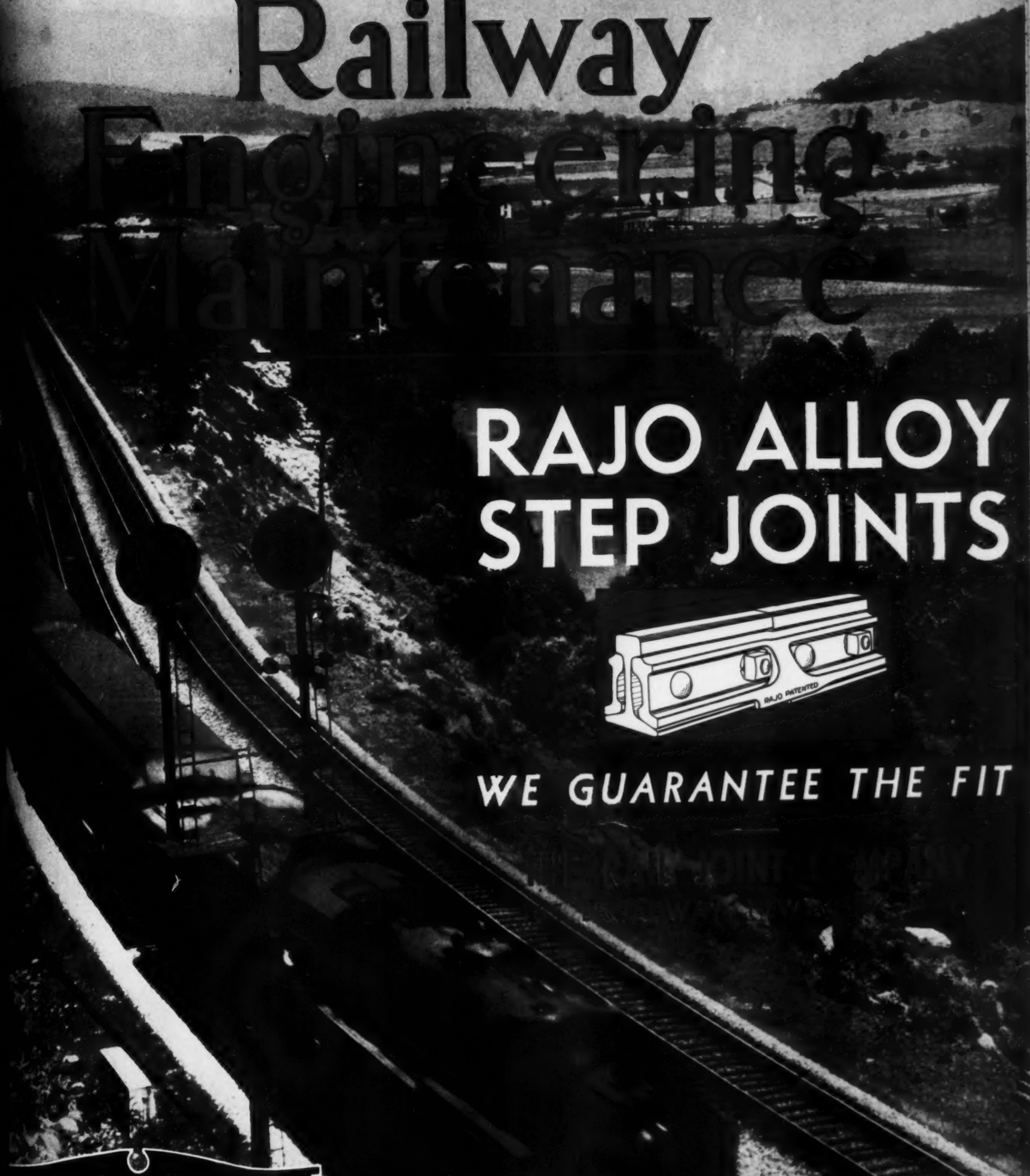
September, 1935

# Railway Engineering and Maintenance



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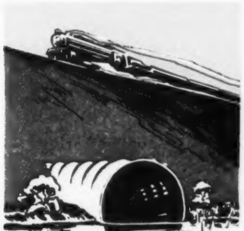

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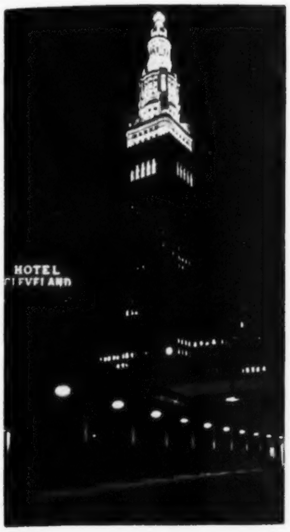


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# Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

## September, 1935



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Railway Engineering and Maintenance

# Action

### A More Militant Attitude Is Needed

DO THE RANK and file of railway employees have any influence in national affairs? This is a question that is raised on many occasions and that is all too frequently answered in the negative, with the result that the employees fail to assert themselves in the protection of their own interests.

When, on August 9 the President signed and thereby made effective legislation providing for the regulation of interstate motor bus and motor truck transportation, that act constituted conclusive evidence of what can be done when railway employees become aroused and determine upon a course of action. While this legislation does not go as far as might be desired in curbing unfair competition on the highways, it will eliminate many of the "wild cat" operators and thereby do much to restrain the unfair competition that has taken so much traffic from the railways.

This legislation was made possible by an enlightened and aroused public sentiment, created largely by action of railway employees, individually and collectively. It should serve to impress every employee with the power that he possesses to curb those inequalities which throttle the industry from which he derives his livelihood and limit his advancement. This will be evident if one reviews the steps in the development of public sentiment leading to the enactment of this legislation.

### A Fifteen-Year Campaign

It was more than 15 years ago that observing students of transportation first began to see that the system of highways that was then being constructed as farm-to-market arteries would soon become connected into through routes between distant centers, and that when this occurred a new agency of transportation would develop that could take much traffic from the railways. The serious effects of this development were first brought home to the local communities when they saw their streets and highways being destroyed by heavy vehicles.

As a result of their clamor, the National Association of Railroad and Utilities Commissioners drafted a bill for the regulation of highway carriers which was first introduced in Congress in 1925. Since that time, legislation has been constantly before Congress where it has been opposed aggressively by truck operators and manufacturers on the ground that it would hamper the development of a new industry and that there was no demand for it on the part of the public.

Railway employees gradually began to appreciate the menace of highway transportation to the security of their own positions as they saw the volume of traffic by bus and truck grow by leaps and bounds. It was on the St. Louis-San Francisco that the employees first began to combat this development and they secured 30,000 signatures to a petition to the senators and representatives of the nine states served by that road, demanding legislation to bring highway transportation under adequate regulation. Two years later the Brotherhood of Railway and Steamship Clerks, Freight Handlers, Express and Station Employees protested in annual convention against the unfairness of the competition that was developing so rapidly. A month later the 850 general chairmen of the four train service brotherhoods united in a similar protest. As other railway employees awakened to the danger of this trend, they also became militant in their demand for protection.

### Other Developments

Employees and taxpayers groups, and ship-by-rail clubs were formed in hundreds of communities. These groups united in state organizations and ultimately in a national association, which initiated measures to acquaint the public with the facts and direct its attention to the chaos that was being introduced in all forms of transportation. This educational work bore fruit, for the sentiment created was so strong that both houses of Congress passed the bill referred to by overwhelming vote and the President signed it promptly.

We have reviewed these developments because they constitute a lesson for railway employees which they should not soon forget. In the complexities of the day in which we are living, we have little opportunity to learn of conditions in other industries, except as the facts are brought to our attention. Conversely, those about us know little about the problems of the railway industry and their relation to public welfare except as the information is laid before them. At first glance, this would appear to be a responsibility of railway management, but there are very practical limitations beyond which it cannot go. Railway employees also have a stake in the prosperity of the railway industry. Furthermore, they have far more influence in their communities than a corporation or its spokesman who has come from some distant center.

It is for these reasons that we have presented, as the leading editorial in each issue of *Railway Engineering and Maintenance* for the last 4½ years, a discussion of some phase of the broad railway problem. In these editorials we have dealt with the unfairness of subsidized highway and waterway competition, government ownership, the relation of railway prosperity to national recovery, grade separation as a public responsibility, the indispensability of the railways, etc.

In these editorials we have endeavored to present facts that would first of all be informative to maintenance employees. More important, however, we have hoped that they would disseminate the facts presented in these editorials among those with whom they come in contact and thereby contribute to an enlightened public opinion regarding the railways, their problems and their relation to our economic welfare.

Our government is based upon the principle of promoting the greatest good for the largest number of our people. If this objective is to be attained, the public must be informed regarding the facts in all of those industries affecting the public welfare in order that it can form its judgment thereon with accuracy and determine its course of action correctly.

Railway employees are more generally awake today than ever before to the realization that their interests are inseparably bound up with the prosperity of the railway industry as a whole and that they have, therefore, a very direct interest in promoting its prosperity. They are also awakening to the means that are essentially theirs in promoting those measures that will contribute to the betterment of the railways and of the public. The enactment of this legislation placing highway carriers under the supervision of the Interstate Commerce Commission demonstrates what can be done when interest is once aroused.

Every employe who has aided in the dissemination of information regarding the inequity of the present highway competition is entitled to a share of the credit for the victory that has just been attained. Every railway employee owes it to himself to co-operate in the furtherance of other objectives which will add to the prosperity of the railways and ultimately to the well-being of those who depend on the railways, directly and indirectly, for their individual welfare.

## Management

### Must Guard Against Waste of Labor

OPINIONS differ widely as to the size of the gang to be employed in renewing rail, and no hard and fast rule can be formulated that will fit all cases. In multiple-track territory, where a track may be taken out of service for the renewal operation, it is of advantage to use as many men as can profitably be employed, as this will make it possible to complete the program more quickly and thus reduce the time that the track is out of service. But the larger the gang the greater the responsibility that is placed on the foreman and his supervisory officer, for no matter how well the organization has been developed for out-of-face work, situations arise—for example, at a turnout or a highway crossing—which necessarily disrupt the routine progress of the work, and unless the foreman is exceedingly alert a part of the men will be idle until "straight away" operation is resumed.

This consideration points to the advantage of using smaller gangs in rail renewals on main tracks in terminals than out on the line. One roadmaster has carried this policy even further in a program involving several miles of rail laying in a territory that includes an interlocking plant. To avoid the loss of time to be incurred by reason of the interruption that would be experienced at each derail and turnout, the change in the rail through the interlocking, a stretch of about a half a mile, was not made until the rest of the program had been completed. The extra gang was then cut down to the minimum required for the work through the switches within the limits of the plant. This practice is by no means unusual, but it illustrates one of the expedients that the supervisory officer must keep in mind when considering the economical utilization of the labor placed at his disposal.

## Culverts

### Look for Evidences of Flood Damage

THE rainfall records of the last three years demonstrate that nature tends to balance the deficiencies in the precipitation of some years with an abundance of water in the years that follow, or vice versa. But because these cycles vary greatly in length, and extraordinary rainfalls occur only at rare intervals, a long siege of subnormal precipitation gives a false sense of security that is eventually shattered, as it was this year when the protracted drought was broken by destructive floods.

Heavy rains and their attendant floods and washouts give rise to a more thorough study of the physical condition of the properties subject to flood damage. They direct special attention to the waterway openings, not only those that proved inadequate, but also those which, although heavily taxed, did not suffer damage. But such investigations are incomplete if they do not also embrace the smaller openings, namely, the arch, box and pipe culverts.

Foremost among the points to be considered in inspecting culverts is whether the high water mark on the upstream side of the embankment indicates that the runoff was backed up by the railway embankment. If this is the case it becomes necessary to ascertain whether this was due to inadequacy of the culvert opening, choking by debris, or restricted flow by reason of insufficient entrance or discharge ditches.

Of no less importance is the examination of the structure for evidence of damage or conditions that point to hazard of failure during some future period of high water. The undermining of wing walls, cut-off walls or aprons at the outlet end of the culvert is probably the most common type of failure, but even when this has not happened, the inspection may disclose a sharp break or hole in the bed of the stream a short distance below the end of the culvert, which is bound to cut its way upstream sooner or later.

With moderate flows this may take place slowly; on the

other hand, the structure may be endangered by the scour that occurs during a single storm of unusual severity.

On the upstream end of the culvert the reverse of this condition is to be expected, namely, the gradual filling up of the stream or ditch, with a resulting reduction in the effective waterway opening. But this is not the only phenomenon to be looked for; changes in the channel may have occurred or be in process that are directing or will soon direct the stream flow against the embankment to one side of the culvert entrance, with an attending likelihood that the embankment will be undercut and thus afford a favorable opportunity for a slide. Such a change may also block the culvert or result in a pronounced restriction of the flow.

But such an inspection should not stop at the two ends of the culvert. Most of the time spent in inspecting culverts is occupied in travel to and from the site and in descending the embankment to the culvert openings. This being the case, a small amount of additional time may well be spent in examining the interior of the barrel, for although there is little likelihood that this examination will disclose anything that has a bearing on the effectiveness of the culvert as a conduit, it may result in the discovery of structural defects that need attention. Since the object of the inspection is to determine what repair or corrective work should be done, it is important that the program include all necessary work whether or not it concerns the culvert's behavior as a waterway opening, since it is much cheaper to do all the work at one time.

# Morale

### As Important as Materials and Methods

WHAT is necessary to maintain good track? If this question were put to a section foreman, a track supervisor and a chief engineer, there is little doubt that substantially the same answer would be given by each, or that these answers would deal with rail, joints, ties, ballast, line, surface, gage and other details which affect the riding qualities of the track. As the question is presented, these answers probably would be justified, for every item mentioned must be given consideration if good track is to be maintained.

But does not the matter go deeper? Ballast cannot be kept clean or depended on to give effective support to the track unless it rests on a stable roadbed. A stable roadbed is impossible without adequate drainage. In fact, the successful performance of each item in the foregoing depends on some condition that may not be apparent to one not intimately familiar with track maintenance.

Going still further back, however, good track depends as much on the morale of the forces which maintain it as it does upon the materials used in its construction. When one finds alert foremen who go at their work in a well-organized way, he can be quite sure that the track is good, and that back of the foremen is an alert supervisor who is all that the term implies. Only in rare cases does the matter end with the supervisor, for if traced to its source it will usually be found that the whole organization, from the ranking officer of the department down, is keyed up in the same way.

Recent developments in train speeds have given maintenance officers and men alike a new viewpoint with respect to track. Track that was satisfactory for the speeds in effect a few years ago may be entirely inadequate, from the standpoint of comfort, for the speeds of today and still more so for those of tomorrow. On some roads, a gradual increase in traffic density and in the number and speeds of passenger trains over a period of years, has given opportunity for the gradual development of a viewpoint regarding track excellence which approaches that demanded by the more spectacular speeds of recent months. On other roads, if the present trend continues, this viewpoint must be acquired.

This is not so much a question of standards as of demand. The nominal standards may be as high as on the first roads, but because of lighter traffic and lower train speeds the actual requirements for excellence may not have been as rigorous. If the organization is alert and properly directed, however, this viewpoint may be acquired very quickly through guidance and experience. If not, it may suffer considerable embarrassment before it is aroused to a full realization of its responsibility.

# Initiative

### Railway Men Are Still on the Job

THE railways have been in business for a long time. Their properties, representing an investment of some 25 billion dollars, cannot be rebuilt over night, and their operating methods, the result of long experience, are not amenable to drastic revision on a moment's notice—two facts which are overlooked by those who contend that railway men are lacking in initiative.

If these accusations were true, there would be no justification for the continued publication of such magazines as *Railway Engineering and Maintenance*, whose function is the dissemination of facts concerning new methods, new materials and new equipment employed on the railways. That there is no dearth of new developments is well illustrated in this issue, which includes six articles that evince the ingenuity and initiative of maintenance officers in putting new ideas to practical use in carrying out their work.

Thus, one article explains how the use of end-door dump cars in a ditching operation has resulted in a marked saving in the time required to make the run to the point of dumping; another reviews an investigation of track pans that led to greater efficiency in picking up water on the run; still another article gives an account of the means employed to sustain interest in the safety movement; a fourth discusses a new method of protecting steel structures from brine drippings; a fifth describes an inexpensive railing for pile trestles and a sixth gives an account of an ingenious device for oiling rail joints. It is significant that each of these innovations is the product of a different railroad, and the fact that all six have gained publicity in but a single issue of *Railway Engineering and Maintenance* should be evidence enough that the railways encourage initiative, and that their officers and employees are alive to the opportunities for the exercise of ingenuity.

# Track Spikes—

## Can They be Standardized?

OF ALL the materials used in track construction, the spike is the simplest. It is also used in the largest numbers, being bought by the millions annually. It is used with all weights and sections of rail. It is supplied in quantity to gangs engaged in both track construction and maintenance. During more than a century, the spike has not departed from the basic design that was used on the first T-rail. Yet, one manufacturer is called on to make currently 11 different designs and another 13, while a third is maintaining live dies for 27 designs and a fourth manufacturer has made spikes of 47 different designs so far this year.

Spikes differ in length, in the shape and size of the head, in the length of the neck (E), in the thickness (W) of the throat, in the overhang of the head at the front and rear, and in other details. Of late, there has been a trend toward the use of a raised, or reinforced, throat spike, similar to that suggested by the Track committee of the A.R.E.A. in 1934, thus adding to the number of designs in current use. Generally, they are made in only two sizes of shank, 9/16 in. and ⅝ in., although a few ½-in. spikes are still made for use with the lighter sections of rail.

One of the most striking features of the large number of designs for spikes is the extremely small differences in details. In 55 different designs which were studied, a total of 13 lengths were found, 10 of which were for ordinary spikes and 3 for spikes to be used with shims where heaving has occurred. Disregarding the latter, the 10 lengths ranged from 5 in. to 7 in., with several variations as small as 1/16 in., while in some cases the length was shown in thirty-seconds of an inch.

### Other Variations

In the 55 designs, as might be expected, the dimension (C), which extends from the lower end of the neck to the upper limit of the point, showed the largest number of variations, 17 in all, with shimming spikes accounting for 3. The range was from 2-19/32 in. to 6 in., with differences as small as 1/32 in. The neck length (E) varied between 8 different lengths, ranging from 7/16 in. to 1-7/16 in., with several variations of 1/16 in., while there were 6 widths (J) across the throat varying from 9/16 in. to ⅞ in., with a number of differences as small as 1/32 in., and 5 thicknesses (W), ranging from ⅝ in. to 15/16 in., with differences of 1/16 in.

When one considers the head of the spike, the number of dimensions and their variations are so numerous and minute as to preclude mention in detail. However, among the 55 designs referred to, are heads of 5 lengths and 8 widths. The lengths range from 1-⅜ in. to 1-⅝ in.—a total difference of only ¼ in.—in increments of 1/16 in. Likewise, the widths range from 1-3/16 in. to 1-15/16 in., with six of the differences 1/16 in. each.

In designing an ordinary track spike, 24 dimensions must be indicated while the raised-throat type and special designs, which latter have been relatively numerous in the past, may increase the number of dimensions by as many as six or more. For this reason, to avoid tiresome repetition, the accompanying table has been prepared to show the number of variations, the extreme range and the smallest difference found in each of the 24 dimensions in the 55 designs of spikes under discussion.

In studying this table, it should be remembered that all but 3 of the 55 designs are ordinary track spikes, and that the only special features in the 3 designs for shimming spikes are those necessary to produce lengths of 7½, 8 and 8½ in. A study of this table in connection with the drawing on which the dimensions have been indicated, will disclose the multitude of minute differences that are introduced into spike design and the slight extent to which most of them effect utility, particularly since spikes of individual design are used indiscriminately with all sections of rail. It should not be forgotten also

**This is the tenth article of a series dealing with the multiplicity of designs for track materials and tools, beginning in the November, 1934, issue, in which both the general problems of standardization and the specific problems connected with various materials and tools have been discussed. These have included rail, track wrenches, tie plates, lining, tamping and claw bars, rail joints, adzes, track bolts, and spike mauls, sledges and chisels. Tamping picks and clay picks will be discussed in the November issue.**

that the table by no means includes the total number of designs, but is presented only as typical of the variations occurring in all designs.

## Changes Frequent

While designs for spikes are not changed with the same frequency as those for some track materials, reference to a number of plans shows as many as 10 revisions of the original design. In one case the design had been changed three times in two years; many others are comparable. In contrast, four of the designs have not been changed since they were developed in 1922 and 1923, these representing the oldest of the total number of designs studied.

Is there any disadvantage in this multiplicity of designs for track spikes? Is there any reason why an engineer should not develop the design which he believes will be most satisfactory for the conditions on his road, or change the design as frequently as he thinks necessary? Spikes are ordered as needed and, except for a necessary reserve at the storehouse, are sent to the point of use promptly. Any ordinary spike can be used with any section of rail, except that some of the shorter ones are not suitable for heavy rail which is supported on thick tie plates.

Because, with the exception noted, spikes can be used with any rail section, there is no reason from a maintenance standpoint why a road should not use any design it chooses. Likewise, since a new design does not affect the utility of the old spikes, any store house stock of the former design can be cleared in regular routine, so that frequent changes in design have no effect on this stock or on the volume of purchases.

There is another side to the problem, however, which is not so simple as the effect on an individual road might lead one to conclude. Spikes are a product of manufacture, and before answering the foregoing questions we must ascertain how multiplicity of design and frequent change in design affect the manufacturer. If they increase his cost of production, of necessity they increase the price which the roads must pay, since he must pass these costs on to his customers.

## Manufacture of Spikes

Spikes are made from square bars which, while rolled on commercial rolls, must be given special care since the permissible tolerance is only 0.010 in.—far less than that for commercial bars. The bars are heated in a gas or oil-fired furnace to a uniform temperature, the degree of heat depending on the composition of the steel. They are then fed to the machines, in which the spikes are made at the rate of from 2,500 to 5,500 an hour, depending on the design.

A set of spike tools consists of 1 set of feed rings, including the necessary gears; 8 pointers, which are mounted on the rings; 1 gripper; 1 die; and 1 header. As the heated bars are fed into the machine, they pass between the rings where the pointer cuts them to the proper length and forms the point. The gripper closes down on the die to hold the piece firmly while the header strikes the blow which forms the head and the neck section.

Every change in the cross section or in the design of the head or of the neck requires a different set of shaping dies, including the header, the gripper and the die. Any change in the length of the spike, even though the design may be identical in other respects, requires a feed ring of different diameter, a new set of pointers and a complete change of driving gears, since the feed must always bear a constant relation to the remaining motion of the machine. A new set of rings, pointers and driving gears, as well as of the shaping dies, is also necessary if an additional amount of metal is required in the head, even where the length of the spike remains the same. Likewise, any change in the tolerance to which the spike is made requires a complete change in the feed rings, pointers and gears, as well as of the dies themselves.

## Tool Costs

Owing to variations in the size and design of spike machines, no typical cost can be given for the separate items which comprise a set of spike tools, as has been done for dies and equipment required for the manufacture of other track materials and tools. In some plants a complete set

of tools may cost only $200; in others a set of feed rings alone may cost as much as $240; while the shaping dies, including the die, the header and the gripper, range in cost from $25 to $80. Tools for spikes made of high-carbon steel cost about 50 per cent more than the foregoing figures, which are based on low-carbon or Bessemer steel spikes.

### Die Costs

Die costs for low-carbon open-hearth, Bessemer and copper-bearing steels are substantially the same. For high-carbon spikes both initial and overall costs, including the intermediate dressings for dies, are about 50 per cent greater. The reason is that the low-carbon steel can be worked at a relatively low temperature, and it has a very fine loose scale which does not interfere with the machine operation, while high-carbon bars must be worked at a much higher temperature and they have a heavy scale which adheres stubbornly and causes pitting of the underlying metal.

Similar variations occur in the cost of changing the tools when transferring from one design of spike to another. In a few cases the variations in design are so small that there is no difference in the amount of metal to be upset and the feed remains the same. In others only the length of the spike is different, so that the dies remain the same and only the feed is changed. In most instances, however, both the feed and the shaping dies must be changed.

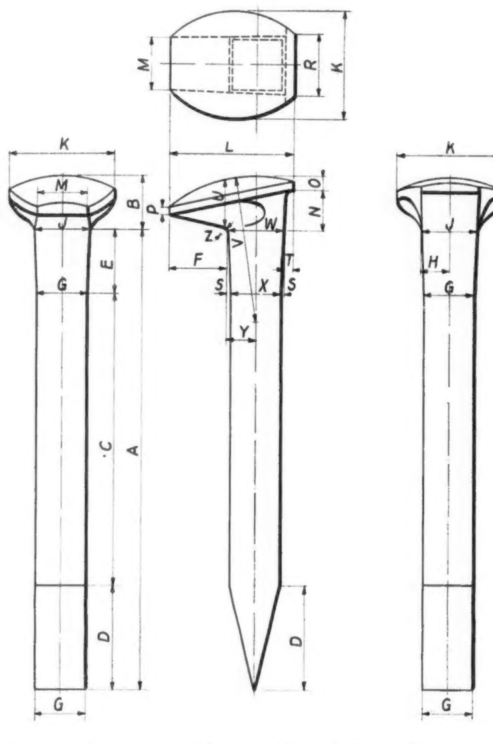
For these reasons, the actual labor cost of changing the tools varies from $16 to more than $25, while the loss of production may amount to as much as 10 tons. In addition, there is considerable loss in fuel if the furnace is kept under heat, while if it is shut down during the change, it must be reheated before operation can be resumed.

As an added complication, some designs require so much metal in the head of the spike that it cannot be upset on an automatic machine by a single blow of the header. Such spikes can only be "roughed" on the regular machines, after which they must be reheated and finished on a hand-fed header, adding materially to the cost.

It is evident from the foregoing that a multiplicity of designs and frequent changes in design add definitely to the cost of manufacturing track spikes. The cost of spike-making tools, including the feeding and shaping equipment, is relatively high and, with few exceptions, a complete set of new tools is required for each design. When a new design is adopted, the former tools become obsolete, yet the manufacturer cannot discard them because he may be called on at any time to furnish spikes to this design. In fact, a case occurred recently where a manufacturer received an order for spikes of a design which he had not made for more than 10 years.

Aside from these differences in design, there are almost as wide differences in the tolerances which are permitted by different roads. The A.R.E.A. specifications permit 1/32 in. over and 1/64 in. under the cross-sectional dimensions specified and ⅛ in. either way in length, that is, measured under the head. Tolerances of 3/32 in. over and 1/32 in. under are also allowed in the head. Some roads, however, allow no tolerance under the specified dimensions, but follow the A.R.E.A. in the tolerance over, except in the length which is limited to nothing under but is allowed to be ¼ in. over.

It is particularly difficult to make spikes to a specification which permits no tolerance under the indicated dimensions, and these difficulties are increased if the spikes are to be made of high-carbon steel, that is, steel with a carbon content ranging from 0.33 to 0.40 per cent. Where there is no tolerance under the specified dimensions, the manufacturer must dress special dies and cut the spike about 3/16 in. longer than the length specified, even though the design may be identical with one which permits a tolerance under the specified dimensions. The manufacturer's costs are thus increased and the railway is paying for more metal than would be necessary if a tolerance under the indicated dimensions were permitted.

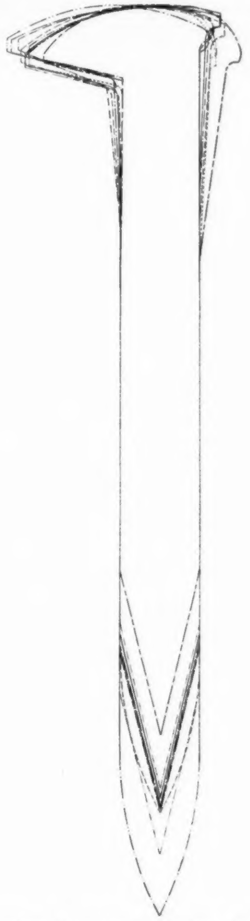



| Dimension | Number of Variations | Range of Variations Inches | Smallest Increment Inches |
|---|---|---|---|
| A | 13 | 5 to 8-1/2* (5 to 7) | 1/16 |
| B | 6 | 1/2 to 13/16 | 1/32 |
| C | 17 | 2-19/32 to 6* | 1/32 |
| D | 3 | 1-1/8 to 1-1/2 | 1/8 |
| E | 8 | 7/16 to 1-7/16 | 1/16 |
| F | 6 | 1/2 to 3/4 | 1/32 |
| G | 2 | 9/16 to 5/8 | 1/16 |
| H | 4 | 9/32 to 3/8 | 1/32 |
| J | 6 | 9/16 to 7/8 | 1/32 |
| K | 8 | 1-3/16 to 1-15/16 | 1/16 |
| L | 5 | 1-3/8 to 1-5/8 | 1/16 |
| M | 4 | 7/16 to 5/8 | 1/16 |
| N | 5 | 5/16 to 1/2 | 1/32 |
| O | 8 | 5/32 to 7/16 | 1/32 |
| P | 3 | 1/16 to 1/8 | 1/32 |
| R | 5 | 9/16 to 7/8 | 1/16 |
| S | 4 | 1/32 to 3/16 | 1/32 |
| T | 5 | 1/16 to 5/16 | 1/32 |
| U | 6 | 5/8 to 17/32 | † |
| V | 7 | 1-3/4 to 2-9/16 | 1/32 |
| W | 5 | 5/8 to 15/16 | 1/16 |
| X | 2 | 9/16 to 5/8 | 1/16 |
| Y | 5 | 5/16 to 13/32 | 1/32 |
| Z | 3 | 3/32 to 3/16 | 1/32 |

*Three lengths, 7½, 8 and 8½ in., are for shimming spikes.
†A number of the designs did not specify this dimension, and the number of variations was estimated by comparing other related dimensions.

**Number and Range of Variations of 24 Dimensions in 55 Designs of Track Spikes**

A few roads demand closer tolerances over the specified dimensions than are required by the A.R.E.A. specifications. In these cases, it not only costs more to make the dies and rings originally, but they must be dressed more frequently and the cost of each dressing is greater than where greater tolerance is allowed. When it is considered that under the most favorable conditions, the life of spike tools is measured in hours, and that with ordinary tolerances



Drawing Showing Variations in Eight Designs of Track Spikes

they must be redressed at intervals of from 8 to 10 hr., it can be seen that tool costs for making spikes mount rapidly as tolerances become more restricted.

These facts demonstrate clearly that a multiplicity of designs for track spikes and frequent changes in design add appreciably to a manufacturer's costs. It is equally clear that he is also placed at a disadvantage by designs which require the spikes to be finished on hand-fed machines, by varying requirements for the chemistry of the steel and particularly by restrictions on the tolerances to which the spikes are made. Not infrequently, these costs are still further increased by small orders, although this occurs less frequently than with bolts. Also it should not be overlooked that many of these costs are multiplied by the number of mills with which a railway places its orders.

With these facts in mind it is pertinent to inquire whether track spikes can be standardized. In substantially all of the mills from 50 to 90 per cent of the production is in accordance with the A.R.E.A. adopted design and the suggested raised-throat design. Since each of these is made in two sizes of shank, 9/16 in. and 5/8 in., and each size in two lengths, this is equivalent to eight designs. The remaining 20 to 25 per cent of the production is of the large number of special designs which have been mentioned.

### Standardization

In view of the fact that, with the exceptions noted, any design of spike can be used with any weight or section of rail, there would seem to be no logical reason why the number of designs cannot be reduced. Certainly 10 lengths within a range of 2 in. cannot be defended. Who can say that one spike will give better service than another that is 1/16 in. longer or shorter? Is there any logic in specifying differences in length of only 1/16 in. when tolerances of 1/8 in. over and under, a total variation of 1/4 in., are permitted? Likewise, can defense be offered for variations of 1/32 in. in dimensions for which a tolerance of 3/32 in. is allowed?

Will the roads accept a rigid standard for spikes? A large part of the production is at present represented by the eight A.R.E.A. designs. Peculiarly, however, some of the roads that are using these spikes also use designs of their own; a few roads are using as many as six to nine designs. In the 55 designs which have been cited, there are no fundamental differences, the variations being so inconsequential that, except for length, as mentioned, they do not affect the utility of the spikes.

Yet, preferences for certain features of design are deep seated. These include deep, broad and wide heads; wide or thick throats to increase the bearing of the spike against the rail and to minimize broken spikes, and the length of the neck; the shape of the back of the head to facilitate the use of claw bars; and the raised throat feature to raise the head slightly above the rail to permit easy access of the claw bar under the head.

There appears to be no logical reason why the present multiplicity of designs cannot be reduced. If these designs are chosen with due regard to retaining the special features for which there is such deep-seated preference, thus providing a suitable selection to meet the diverse needs, or desires, of the individual roads, they will more readily gain universal acceptance on the railroads.

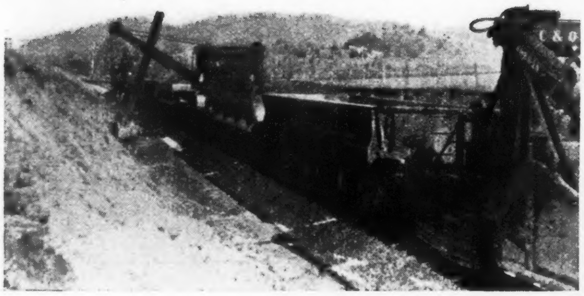
## Eleven Men Die in Motor Car Accident

IMPROPER supervision and the lack of discipline were the reasons for a motor car accident on the Southern Pacific near Roseville, Cal., that resulted in the death of 11 employees and the injury of one employee. This is the conclusion reached by the Bureau of Safety of the Interstate Commerce Commission in its report of this accident, which occurred on April 8.

The accident occurred about 1.8 miles east of Roseville where a work train, traveling from 20 to 30 miles an hour, ran into a motor car and a trailer on which 11 trackmen and three assistant foremen were riding. These men had been employed in repairing a washout about six miles east of Roseville and at the conclusion of the day's work, failing to get a ride on the work train on its way back to Roseville, were instructed by the roadmaster to wait until the return of the work train.

Reluctant to wait for the return of the train, one of the assistant foremen insisted on taking the men back to Roseville on a motor car and trailer in spite of the objections of the other two assistant foremen who called attention to the roadmaster's instructions. On the way back, one of the assistant foremen asked that the motor car be stopped at a special disc type of train indicator signal which is operated by the automatic block signal system for the guidance of track motor cars to ascertain if the work train was in the block, owing to the fact that darkness and a light rain resulted in low visibility, but the assistant foreman who had assumed charge of the gang ignored this suggestion, with the result that the motor car collided with the work train.

Supplementing its conclusions, the report of the Bureau of Safety recommended that when employees are to be transported on motor cars, under circumstances such as obtained in this case, consideration be given to the desirability of making such movements upon train order authority so that they may be safeguarded.



One of the New Ditching Train Set-Ups on the C. & O.

These Ditchers Are Operating From Drop-End Side-Dump Cars While Loading Solid-End Side-Dump Cars

# Cutting Ditching Costs

**Drop-End Side-Dump Cars and Crawler-Mounted Ditchers in New Train Set-Up on the Chesapeake & Ohio Minimize Switching and the Number of Runs to the Dump, and Permit More Intensive Operation. Saving in Equipment Charges Estimated at $26 Per Ditcher Per Day**

THROUGH the use of air-operated side-dump cars with drop ends and gasoline-operated ditchers on crawler tread mountings, the Chesapeake & Ohio is speeding up its routine ditching and cut-widening work materially and at the same time is effecting sizable economies in equipment charges. Since the new cars permit the ditchers to move through them as one car after another is loaded, the ditchers can be kept busy almost constantly, and the time ordinarily consumed in setting out cars or in running to and from the dump at frequent intervals, as is necessary in cases where only one car can be loaded at each end of the ditcher, is reduced to a minimum.

### Previous Practice

Long ago the C. & O. gave up the use of ditchers operated over a succession of flat cars, which were unloaded at the dump by plow unloaders, and substituted ditchers operated on a single flat car coupled between two 20 or 30-yd. air-operated side-dump cars. The latter equipment and arrangement offered a number of advantages over the earlier arrangement, but had the objection that it was necessary to run to the point of dumping, or to do considerable switching, for every 40 yd. or so loaded. The use of 30-yd. cars in this ditching arrangment offered little advantage over 20-yd. cars, because the length of the ditcher boom did not permit loading them to capacity. However, the larger cars were employed generally because of their adaptability to general maintenance work other than ditching.

A study of the time lost by ditchers in running to the points of dumping with loads averaging 40 cu. yd. showed that, under average conditions, five trips a day were made to the dump, with a loss in ditcher time equivalent to $26.33 a day per ditcher. With 14 ditchers working approximately 200 days a year on the road, this indicated a possible loss of efficiency of about $73,724 a year.

This analysis led to the development of drop-end side-dump cars, and crawler-mounted ditchers. With this equipment the number of cars in the ditching train can be extended up to the daily loading capacity of the ditcher. Thus, with sufficient car capacity available, runs to the dump can be limited to one a day if found desirable, making possible the most intensive use of the ditcher.

Co-operating with the railroad, several car manufacturers have developed drop-end designs for their standard side-dump cars, which thus permit the movement of crawler-mounted ditchers through the cars. These designs vary in minor details, but are fundamentally the same. Essentially, the cars are the standard 30-yd., side-hinged or trunnion-type models of the companies, except for the drop-end feature and some special reinforcing of the floor and floor supports to carry the concentrated working load of the ditcher. The drop end doors are hinged in each case and are strongly reinforced to support the weight of the ditcher as it moves from car to car.

### Operation of Drop Ends

In the types developed, the drop ends can be air-operated or not. Where air operation of the end doors is provided, the end door cylinders are so interlocked in the car-dumping air line that the car cannot be tilted when the end doors are down. Where the end doors are not air-operated, it is intended that they shall be raised and lowered by a quickly-applied chain or cable hitch to the bucket of the ditcher, or directly by the bucket itself. With this type of door operation, protection against the tilting of the car while it is occupied by a ditcher is provided by so locating the side dumping control valves at the ends of the cars that they cannot possibly be reached and operated while the end doors are down. The only other special feaures of the drop ends generally are that they have been provided with angle guides on their inner faces to direct the treads of the ditcher in moving on or off the car, and that some of the doors have mitered ends in conjunction with miters on the ends of the side doors.

Owing to the sturdy construction of the cars, as reinforced for carrying a ditcher, and the fact that the

The Ends of Two of the New Cars Dropped to Permit Free Movement of the Crawler-Mounted Ditcher Between Them


Ditching From a Position Between One of the Drop-End Side-Dump Cars and the "Home" Car—This Permits Loading the New 30-Yd. Cars to Capacity

weight of the dumping mechanism is concentrated below the floor level, these cars have a low center of gravity, which, combined with the wide spread of the side trunnions, gives them great stability. As a matter of fact, it is said that they support a ditcher more safely and with greater stability than an ordinary flat car.

## Changes in Design

While it was anticipated at first that the use of ditchers on side dump cars might involve certain important changes in usual ditcher design, the study of the proposed working combination showed that the only important requisite was that they have a crawler-type mounting with an out-to-out width slightly less than the inside width of the car at the floor level. This permitted a width of 8 ft. to 8 ft. 5 in., which is ample from the standpoint of safe operation of the ditcher.

Ditchers with either steam or internal combustion engines and with crawler tread mountings can be used with the drop-end cars, although the C. & O. is employing gasoline engine units, two of which were placed in service during the last year. These units, which weigh about 60,000 lb. each, have a 5/8-yd. dipper and an out-to-out width of treads amounting to 8 ft. 5 in.

Aside from the crawler mounting, they are special only in that their dipper sticks and booms for routine ditching from cars are longer than standard, to provide dumping radius sufficient to load to capacity the 30-cu. yd. solid-end dump cars already in service. They may be equipped with a crane boom for general hoisting or for dragline work.

With only four drop-end side-dump cars and two tractor-mounted ditchers at the present time, the C. & O. has been operating the equipment in combinations of five cars, each of the combinations including two of the drop-end side-dump cars, two ordinary side-dump cars with solid ends, and a flat, or "home" car, for the ditcher. This equipment is assembled with the ordinary dump cars at the ends, the flat car in the center, and a drop-end car between the flat car and each of the regular dump cars. The only special feature of the "home" cars is that they are provided with two structural steel channels on top of their usual timber floor, placed with their flanges up, and at the proper distance apart to act as tread plates and guides for the crawler treads of the ditchers. These channels are ramped upward at their ends to compensate for the higher level of the deck of the dump cars.

## Procedure Followed

By operating from the empty drop-end cars in the set-up described, the ditcher can first load the standard dump cars and then, by backing on to the "home" car can fully load the drop-end cars. As a result, even with this limited equipment of drop-end cars, four cars can be loaded before it becomes necessary to set them out or to run to the dump. As is readily evident, any number of the drop-end side-dump cars can be coupled between the "home" car and the standard dump cars at the ends of the train to minimize the number of set-out movements or runs to the dump, the practical number being limited only by the daily production of the ditcher.

Whenever the length of the cuts being ditched permits, the C. & O. operates its ditchers in multiple, thereby minimizing work train expense.

The Number of Runs to the Dump are Frequently Cut in Half with the New Type and Arrangement of Ditching Equipment

This has been done effectively with the new drop-end car and tractor-mounted ditcher equipment by bringing together the two five-car single ditcher assemblies already described. With such a set-up, eight cars can be loaded before it becomes necessary to switch them out or to run to the point of disposal.

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TUNNEL RECORD—With 17 tunnels in 11 miles, the San Diego & Arizona probably holds the tunnel record for the distance. These tunnels are in the mountain side 900 ft. above the bottom of the gorge, and in the location of the line, it was necessary to let the surveying parties down the mountain side with ropes. A peculiar feature of these tunnels is the fact that even in the longest one, 2,579 ft., there is a complete lack of smoke and fumes. The constant suction through the canyon provides a natural air-conditioning system.

# Roofs—

## Constructing an Asbestos-Felt Built-Up Roof

**In the seven preceding articles of this series which began in the January issue, the instructions contained in the manual of roofing practices, which has been prepared for the use of its building forces by the Northern Pacific, have been given for various types of roofing. The present article, the eighth of the series, covers the methods for applying and maintaining built-up roofing of asbestos-felt and asphalt.**

FOR SEVERAL reasons, built-up roofing constructed of asbestos-felt and asphalt requires greater care in its application than roof coverings of coal-tar pitch, while there is considerable difference in the details that must be given attention. Despite this difference, however, the general technic is the same for the two classes, the differences being mainly those that arise by reason of the differences in the material. One important point of difference is that the gravel surface is generally omitted, a special surface finish of liquid asphalt being employed in place of the gravel. Some roads prefer, however, to apply the mineral surface and this can be done where desired. The methods outlined in the manual to be followed on the Northern Pacific are as follows:

### Materials

All materials shall be of the best grades and of approved brands. Every container and every roll of felt shall bear the manufacturer's brand and label.

Base-felt shall be asphalt-saturated asbestos, coated with asphalt on both sides and sanded. It shall weigh not less than 60 lb. per 108 sq. ft. Finishing felt shall be asphalt-saturated asbestos, coated with asphalt on one side only, and shall weigh not less than 20 lb. per 108 sq. ft.

Flashing shall be an approved preformed membrane consisting of laminations of waterproofed cotton fabric and asphalt-saturated rag felt or asbestos felt, cemented together with asphalt. It shall weigh approximately 32 lb. per 100 sq. ft.

Rag felt for use under insulation shall be asphalt-saturated and shall weigh not less than 15 lb. per 108 sq. ft.

Insulation shall have the proper density for the use for which it is intended. It shall be in the form of sheets of such size as is recommended by the manufacturer for this purpose. The sheets shall be ½ in. thick. Asphalt shall be of the grade suitable for the slope of the roof upon which it is to be used. It shall conform to the requirements of the United States Government's Master Specification No. 88 for Asphalt for Unsurfaced Built-Up Roofing.

Liquid asphalt roof coating shall be of a type that is applied cold and shall contain no asbestos or other fibre. Asphalt concrete primer shall be of a type that is applied cold.

Plastic roof cement shall consist of asphalt containing asbestos fibre and shall be of such consistency that it can be worked with a putty knife or trowel.

Nails for fastening down felts or sheet metal shall be galvanized, barbed, 1 in. long, 12 gage and with heads not less than ¼ in. in diameter. When applied through insulation, they shall be 2 in. long. Nails for fastening down insulation to wood roof decks shall conform to the same requirements, except they shall be 10 gage and have heads not less than 7/16 in. in diameter.

Tinned discs or caps shall be not less than 1¼ in. in diameter and shall be flat; bell or cup-shaped caps shall not be used. All nails used for fastening felts shall be driven through tinned discs.

Counterflashing, edging or any other necessary sheet metal shall be 24-gage galvanized iron of an approved brand.

While being heated, asphalt shall be stirred frequently to prevent burning. It shall not be heated above 450 deg., F., and shall not be applied at a temperature of less than 350 deg. F. Asphalt that is cut back or diluted with other materials shall not be used.

Felts weighing 30 lb. or more per 100 sq. ft., shall be unrolled, turned over, piled up and permitted to flat-

ten. As they are required in the work, they shall be rerolled loosely in the opposite direction before application. All excess sand surfacing shall be broomed off.

All felts shall be laid without wrinkles or puckers and so that the direction of the flow of water is over or parallel to the laps and never against them.

Where the pitch of the roof is three inches, or less, to the foot, the base felts may run either parallel with or at right angles to the eaves. The finishing felts shall be laid parallel with the eaves. Where the pitch is greater than 3 in. to the foot, all felts shall be laid at right angles to the eaves.

Asphalt shall be applied by mopping so that the felts are fully embedded therein to their entire width. In no place shall felt touch felt except as otherwise provided. Approximately 30 lb. of asphalt shall be used per 100 sq. ft. of roof in mopping between felts and between felts and insulation.

As the felts are applied, they shall be unrolled closely behind the mop so that at no time shall the mopping be more than three feet ahead of the roll. The mopping of half a sheet and folding it back will not be permitted. The felts shall be broomed in to the asphalt while it is still hot. Any blisters or puckers that occur shall be pierced with the point of a knife to release the air and then broomed down.

All metal flashing, outlet flanges, etc., shall first be primed with the asphalt primer. No roofing material shall be laid over these surfaces until the primer has dried. All wall surfaces which are to be coated with asphalt shall first be primed.

## On Wood Roof Deck

As with the tar and gravel roof, asbestos-felt and asphalt roofing may be applied directly to the sheathing or over insulation. The manual does not contain instructions for applying built-up roofing of either class to concrete or other similar surfaces. Built-up asphalt roofing is constructed of either four or three-ply. The instructions contained in the manual for the application of the former follow:

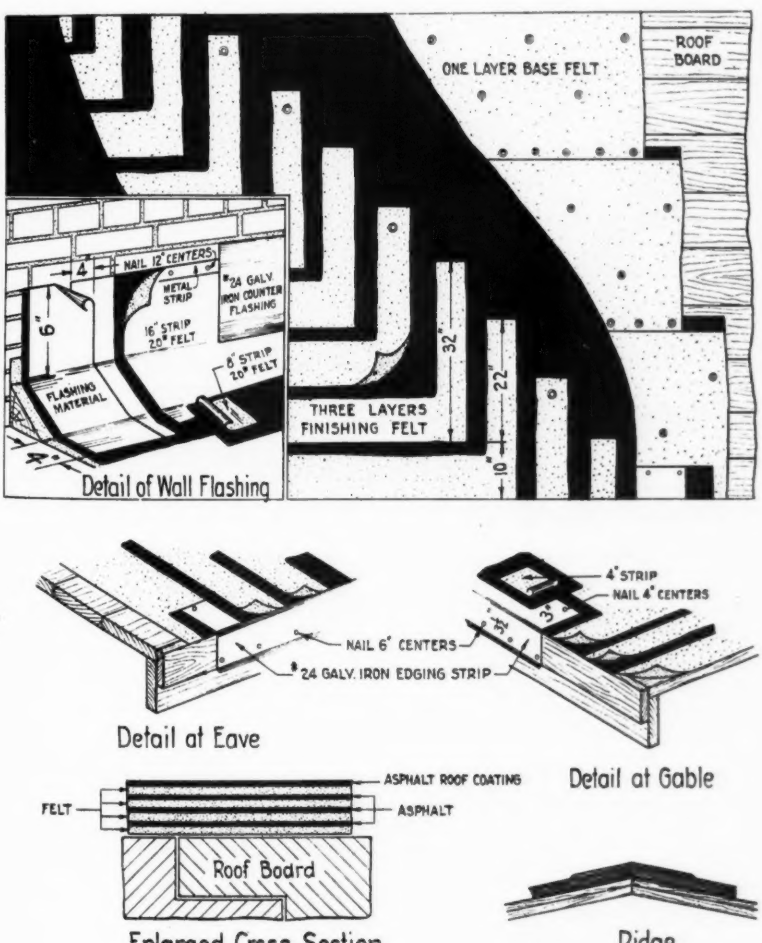
For the construction of four-ply asbestos-felt and asphalt built-up roofing, there shall be used one thickness of 60-lb. base felt, three thicknesses of 20-lb. finishing felt, and for each 100 sq. ft. of completed roof, not less than 90 lb. of asphalt for mopping between felts and one gallon of liquid asphalt roof coating for the surface finish.

In making the application, lay one thickness of 60-lb. felt over the entire roof deck, lapping all sheets 2 in., and extend it 2 in. up but do not cement it to all vertical surfaces to be flashed. Seal the laps with hot asphalt and nail on six-inch centers. In addition, nail the sheets in two parallel rows approximately 10 in. apart and 10 in. from the laps, spacing the nails on 18 in. centers staggered.

Apply galvanized-iron edging strips at the eaves. These shall be made in accordance with the details shown in the drawings. Nail the strips to the roof on four-inch centers about one inch from the inner edge. Also nail to the fascia, spacing the nails on six-inch centers about one inch from the lower edge. The edging strips shall be applied before the finishing felts are laid. They shall be primed with asphalt primer which shall be allowed to dry before the strips are placed, or before the mopping for the finishing felts is applied. The finishing felts shall be laid over the top of the edging, flush with the eaves and mopped solidly to the edging with hot asphalt. Apply the edging at the gable overhang after all felts have been laid, otherwise the work shall be the same as at the eaves. Cover the exposed edge on the roof with a strip of 20-lb. felt 4 in. wide, which shall be embedded in and mopped over with hot asphalt.

Over the entire surface of the base felt apply a mopping of asphalt into which, while hot, there shall be embedded three thicknesses of 20-lb. finishing felt with the coated side down, placing them so that each sheet overlaps the previous sheet 22 in., leaving 10 in. exposed (where the sheets are 32 in. wide). Extend this layer two inches up, but do not cement it to, all vertical surfaces to be flashed. Solid moppings of asphalt shall be applied between the thicknesses of three-ply construction so that at no point shall felt touch felt. Nail each thickness on nine-inch centers 3/4 in. back from the edge.

In addition to this three-ply layer, apply one thickness of 20-lb. felt on




Method of Laying 4-Ply Asbestos Felt Roofing

the ridges. This strip shall be a full width sheet and it shall be embedded in asphalt and mopped to the roof surface.

Prime the entire brick or concrete surface with asphalt primer which shall be allowed to dry, over which flashing is to be applied. All base flashing shall be applied so as to extend not less than six inches up the vertical surfaces and not less than four inches out on the roof. These dimensions shall be measured from the edges of the fillet, as indicated on the drawing. The flashing material shall be cut into widths of 18-in. --where sheets are 36 in. wide.

After the priming coat has dried, the surfaces of the roof and of the wall to which the flashing is to be applied, shall be mopped with hot asphalt and the flashing material shall be pressed into place. The flashing shall then be mopped with asphalt and covered with a single thickness of 20-lb. felt, having a width of 16 in.

This will leave an exposed strip of the flashing two inches wide on the roof surface. Centered over the edge of this strip, place a strip of 20-lb. felt eight inches wide, embedded in and mopped over with hot asphalt.

End laps of the flashing and of the covering shall be staggered. These laps shall not be less than four inches. Fasten the flashing and covering to the walls or other vertical surface, nailing along the top edge on 12 in. centers through a strip of sheet metal two inches wide, as shown in the drawing. This will constitute the base flashing. Over the base flashing set a counterflashing of galvanized iron bent into the brick joint, or other groove provided, immediately above the base flashing and wedge securely and cement in place. The counterflashing shall be wide enough to extend down to the top of the fillet.

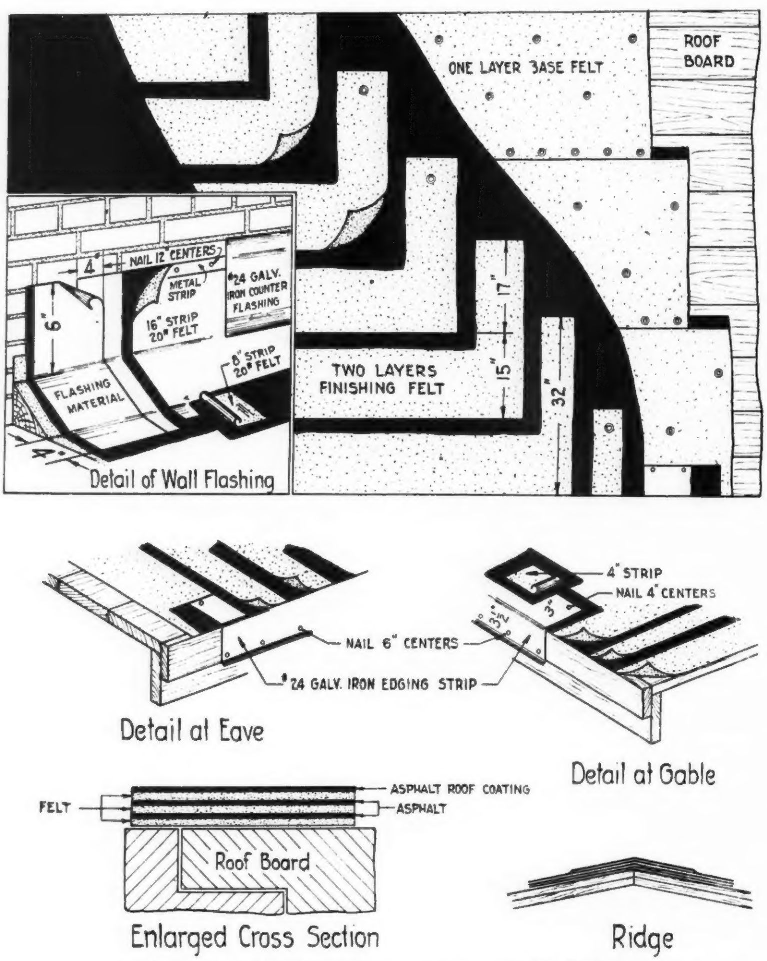
The same procedure shall be followed around skylights or other projections through the roof surface, except that the counterflashing may be omitted where it is not considered necessary.

As the final operation, finish the entire roof surface with liquid-asphalt roof coating, applying approximately one gallon for each 100 sq. ft. of the finished roof area.

Three-ply built-up asbestos roofing is identical with the four-ply construction except for the difference in the number of plies and the width of the lap of the mopped-on sheets. For this reason, the instructions in the manual are largely a repetition of those already given. This being so, all but the two paragraphs which differ from the foregoing are omitted. These two paragraphs follow:

In the construction of a three-ply asbestos felt and asphalt built-up roof there shall be used one thickness of 60-lb. base felt, two thicknesses of 20-lb. finishing felt, and for each 100 sq. ft. of completed roof not less than 60 lb. of asphalt for mopping between felts, and one gallon of liquid asphalt roof coating for the surface finish.

Over the entire surface of the base felt there shall be applied a mopping of asphalt into which, while hot, there shall be embedded two thicknesses of 20-lb. finishing felt, coated side down, each sheet overlapping the previous sheet 17 in. This leaves 15 in. exposed—for sheets 32-in. wide. This layer shall extend 2 in. up, but shall not be cemented to, all vertical surfaces to be flashed.




**Roofing Details for 3-Ply Asbestos Felt over Wood Deck**

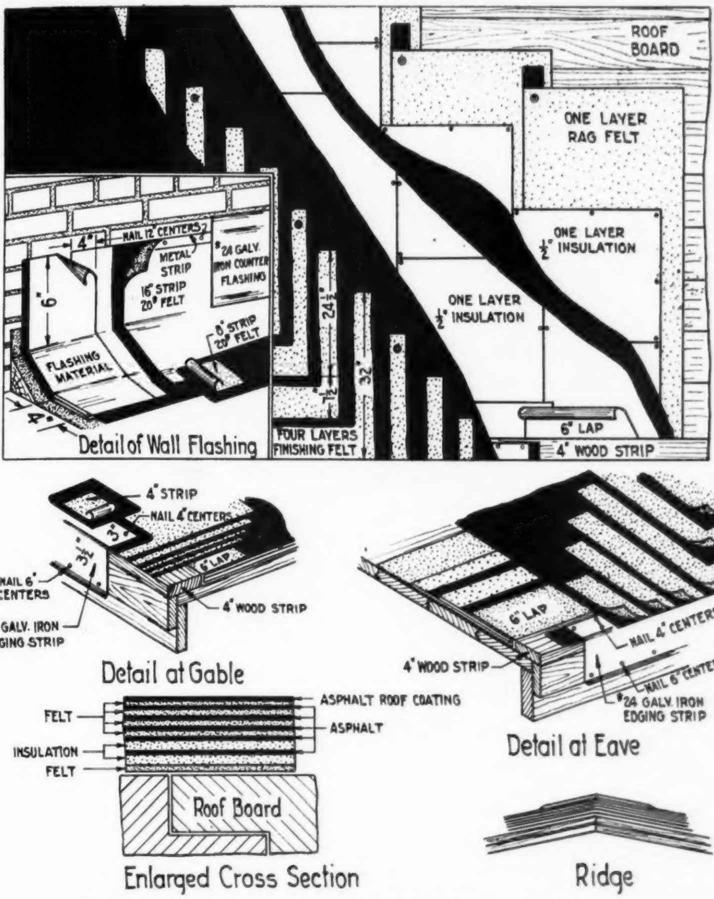
### Over Insulation

In making an application of asbestos-felt and asphalt roofing over insulation, the four-ply construction is used. As a result, many of the requirements are identical with the foregoing instructions for four-ply roofing. For this reason, and to avoid repetition, only those instructions which do not apply to ordinary four-ply construction are given. The remainder will be found under that heading in this article. The paragraphs that differ from, or are in addition to the instructions for applying four-ply asbestos felt roofing follow:

In the application of asbestos-felt roofing over insulation there shall be used one thickness of rag felt under the insulation, two thicknesses of ½-in. insulating board, four thicknesses of 20-lb. asbestos finishing felt over the insulation, and for each 100 sq. ft. of completed roof not less than 150 lb. of asphalt for moppings and one gallon of liquid asphalt roof coating for the finish.

Wood strips of the same thickness as the insulation and 4 in. wide shall be installed at all eaves and overhanging gable ends, flush with the edge of the roof deck to act as a stop for the insulation.

First lay one thickness of 15-lb.




Roofing Details for 4-Ply Asbestos Felt Laid over Insulation

rag felt over the entire roof, lapping all sheets six inches. Seal the laps with asphalt and nail sufficiently to hold in place. Keep the asphalt mopping of the laps back two inches from the edges so that no asphalt will extend over the felt and seep through the wood deck. At all edges, turn the sheets up seven inches so that later they can be sealed down over the insulation.

After the felt is in place, cover the entire roof deck with two thicknesses of ½-in. insulation, the first layer of which shall be tacked in place with 1 in. nails. The surface of this insulation shall then be mopped with asphalt and the second layer of insulation embedded in it while still hot, laying it in such manner as to break joints in both directions with the first layer. The tightness of the joints at the edges shall be in accordance with the recommendation of the manufacturer. Next, secure the two layers of insulation to the sheathing by nailing through the top layer along the edges and through the center of each sheet, with 2-in. nails on 12-in. centers, staggering the center row of nails. After the insulation is in place, mop back the upturned edge of the underlaying felt over the insulation with asphalt. Insulation shall not be exposed to the weather and no more shall be laid than can be covered with roofing felts the same day.

At the eaves, apply galvanized iron edging strips made in accordance with the details shown in the drawing. Nail these strips to the roof on four-inch centers about one inch from the inner edge. Nail to the fascia, spacing nails on six-inch centers about one inch from the lower edge. The edging shall be applied to the eaves before the finishing felts are laid. It shall be primed with asphalt primer which shall be allowed to dry before the edging is placed or before the mopping for the layers of finishing felt is applied.

The latter felt shall be laid over the top of the edging and flush with the eaves, mopping it solidly to the edging with asphalt. At the gable overhang, the edging shall be applied after all felts have been laid, otherwise the application is the same as that made as at the eaves. Finally, cover the exposed edge on the roof with a strip of 20-lb. felt 4-in. in width, embedding it in and mopping it over with asphalt.

Over the entire surface of the insulation apply a mopping of asphalt into which, while hot, there shall be embedded four thicknesses of 20-lb. finishing felt with the coated side down. Each sheet shall overlap the previous sheet 24½ in., leaving 7½ in. exposed—for sheets 32 in. wide. Extend these sheets 2 in. up but do not cement them to all vertical surfaces to be flashed.

The remaining requirements for flashing on vertical surfaces and around skylights and for finishing the roof surface with liquid asphalt are the same as the requirements for applying four-ply construction directly to the roof deck. For this reason they are not repeated.

## Maintenance

Roofs constructed of asbestos felt and asphalt, like those of coal-tar pitch, should serve for a long period without requiring maintenance, provided the material and workmanship are of the proper grade. To avoid the possibility that damage may occur and become serious before it is given attention, roofing of this class should be given regular inspection and repairs should be made promptly after trouble is detected. The instructions contained in the manual for maintaining this class of roofing follow:

When an asphalt and asbestos-felt roof is constructed properly, it should require practically no maintenance for many years. If leaks should develop, the weak points should be reinforced by mopping on two additional thicknesses of finishing felt, the top layer to overlap the bottom four inches around all edges. A top coating of asphalt roof dressing should be applied to the patch and for several inches out on the roof surface.

Periodic inspections should be made and any trouble detected should be corrected before it becomes serious.

Joints in the flashing should be watched carefully. If any show signs of loosening they should be cemented again or reinforced as may seem more desirable.

Laps on the roof surface that show signs of loosening should be treated in the same manner.

The original top dressing will generally weather out at the end of 10 or 12 years and should be renewed.

Plastic roof cement can be used to good advantage in making maintenance repairs. It is particularly useful in connection with flashing, around skylights, etc.

# Tests of Track Pans Lead to Improved Design

By W. L. CURTISS

**Mechanical Engineer, New York Central**

**The New York Central conducted experiments at three installations with the aid of a test train to determine the requisites for maximum efficiency in picking up water "on the run." The information developed provided the basis for improvements in design and practice affecting the dimensions and shape of the pans, their elevation relative to the top of the rail, the depth of "scoop" immersion and the speed of the train when taking water.**

THE track pans in use on the New York Central Lines having been built at various times in the past, are of several different types and differ as to construction, width, depth, location in relation to the top of rail, etc. In 1928, a special committee was organized, with John V. Neubert, chief engineer maintenance of way, New York Central, as chairman, to make an intensive study of track pan design, and arrangements were made for a series of water-scooping tests at three different pan locations to determine—

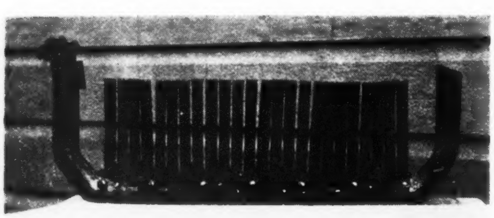
1. The proper design of track pans
2. The correct location of a track pan in relation to the top of rail
3. The correct setting of the water scoop in relation to the top of rail
4. The most economical speeds at which to scoop water

The pans selected for these tests were located at Rome, N. Y.; Painesville, Ohio; and Marshall, Mich.; each of different design and construction. The pan at Rome consisted of two 8-in. channel sections, facing each other and riveted to a flat plate that formed the bottom, with a 20-in. clear opening at the top. The top of the pan was $1\frac{9}{16}$ in. below top of rail, and the water level was maintained ½ in. below the top of the pan. The length of the pan was 1,998 ft.

The Painesville pan was of the bent-plate type, with continuous angles at the bottom to support it along the outside edges and 1½-in. continuous angles along the outside at the top. The opening at the top was 17⅞ in., and depth was $7\frac{7}{16}$ in., the top of the pan was level with the top of rail, and the water line was maintained 1 in. below the top of the pan. The length of the pan was 2,058 ft.

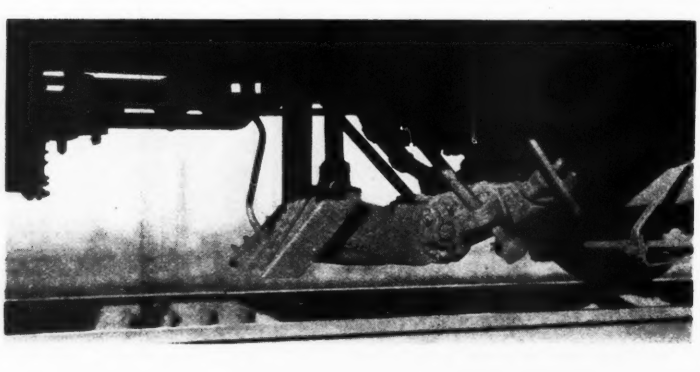
The Marshall pan was also of the bent-plate type, with supporting angles along the bottom while the 1½ in. continuous angles at the top were on the inside. The opening at the top was 19 in., the top of the pan was 1¾ in. below the top of rail, and the water level was ¾ in. below the top of the pan. The length of the pan was 2,013 ft. After the locations were decided on, the equipment and methods to be used in the tests were carefully studied, and the tests were conducted in November, 1928.

*Abstract of a monograph presented by the Committee on Water Service, Fire Protection and Sanitation before the convention of the American Railway Engineering Association.



At the Left: The Track Pan Gage, Consisting of Leather Strips Set in a Metal Frame. Marks Left on Fresh Paint Applied to the Strips Showed the Position of the Scoop

Below: The Scoop Under a Tender, Shown in the Raised Position



The test train consisted of a locomotive, an office car and four six-wheel-truck steel passenger cars. The locomotive was a class L-2a, 4-8-2 type equipped with a tender of 15,000 gal. capacity. Previous to the tests, the tender was calibrated for water capacity for every tenth of an inch of depth. Each corner was stenciled in fifths of an inch and provided with a manometer tube in which the water level could be observed. The locomotive was also equipped with a locovalve pilot complete, to indicate and record both the speed and the cut-off.

An electrical contact on the scoop, recording through a lamp on the tender, indicated when the scoop was in the full "down" position. The tender was also equipped with valves in the bottom to drain water from it in preparation for each test. Another method employed to drain the tender was to use a boiler feed pump with an outlet in the feed line. The water scoop, which is standard equipment on this class of locomotive, was of the "Lake Shore" type.

Two stop watches were necessary; one to obtain the average speed of the locomotive over the track pan and the other to determine the duration of the time that the scoop was in the lowered position, or picking up water. Scoop gages were used to check each setting of the scoop when lowered to various positions below the rail. The office car was used by the test crew for compiling data and the four coaches were provided mainly to furnish braking power.

The Track Pans at Rome, N.Y., Are of the Type Adopted as a Result of the Tests

Five manometer tubes were placed in each pan at approximately equal distances apart for use in obtaining the water level. The track-pan gages used to determine the water scoop clearances were constructed of rectangular strips of ¼ in. leather set in a metal or wood gondola-shaped frame. The water capacity of each pan was calibrated for every $\frac{1}{16}$ in. in depth, by calculations from actual field measurements. Previous to making the tests, the track pans were placed in good alinement and surface.

The engine crew consisted of a locomotive engineman, a fireman and a road foreman of engines. The engineman was instructed regarding the speed desired for each test, and full boiler pressure was maintained by the fireman during the test. The fireman also operated the scoop. The train crew consisted of a conductor and at least two trainmen. A trainmaster supervised the movements of the test train.

The locomotive test crew consisted of two special apprentices, one machinist apprentice and a test engineer. Their duties were to obtain water level readings at each of the four corners of the tender, the rate of speed over the pan by means of a stop watch, and the duration of the scooping period, as well as to make necessary adjustments or repairs to the scoop.

Each day two apprentices or engineers acted as calculators in the office car and made approximate checks of the data for each run to determine if check runs were necessary to fill the required quota of tests. The work on the ground at the track pan required five men as manometer tube observers to read high and low water levels in the pan. An engineer recorded all data taken at the track pan. Four men placed torpedoes, and observed and measured the distance that the scoop was in operation. Another engineer obtained data regarding the pan gage for water-scoop clearance. The writer had direct charge of the entire test.

Tests were made at the three different locations as follows:

*Rome, N. Y.* On the westbound track, with the scoop set 4½ in., 5½ in., and 6½ in. below the top of rail, at speeds of 35, 40, 45 and 55 miles per hour, respectively.

*Painesville, Ohio.* On the eastbound track, with the scoop set at 4½ in. and 5½ in. below the top of rail, at speeds of 35, 40, 45 and 55 miles per hour, respectively. In addition, a few runs with a 5½ in. setting were obtained at approximately 58 miles per hour.

*Marshall, Mich.* On the westbound track, the same program was followed as at Rome except for the omission of the 4½ in. scoop setting. A few additional runs were made at 60 miles per hour with the 6½ in. setting and at 65 miles per hour with the 5½ in. setting of the scoop.

## Test Methods

When all was in readiness for a test, readings were obtained of the water levels in the tender in inches (the average height maintained was about 25 in.). Then, on a signal from the test engineer, the train was started and accelerated to the desired speed (determined as closely as possible from the loco-valve pilot indicator in the cab), before reaching the track pan approach. At this point a signal was given by the foreman in charge of the manometer tube observers to take readings of the water level in the pan, at each of the five stations.

When the engine and tender were over the pan, the fireman worked the operating lever that dropped the scoop, and it remained in the scooping position for as near the full length of the pan as possible. The time during which the scoop was down was obtained with a stop watch by an observer on the locomotive, the full "down" position being indicated by means of an arm attached to the scoop which made contact in an electrical circuit and lighted a lamp mounted on the tender. The speed was obtained in the cab by another observer with a stop watch, who timed the interval between two torpedoes placed ¼ mile apart on the rail along the track pan.

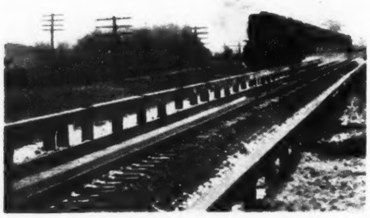
The distance that the scoop was in the "down" position was determined by track observers who noted the exact points where the scoop entered and left the water. The scoop was raised just before arriving at the exit of the pan, and the test train was then stopped and readings of the water level at the four corners of the tender were again obtained. Readings of the water level at the five track-pan stations were again taken after the water had ceased surging and before the pan was refilled.

Before the start of any individual test run, the boiler was filled to almost a "full glass" and no additional water was taken into the boiler during the run. During all tests, the valves that control the refilling of the pan after scooping were operated manually in order to fix the height of the water for each test. After the required speed had been obtained, the throttle and reverse lever were maintained in positions to insure constant speed while scooping. The scoop mechanism was examined frequently for defects, and the settings were checked every two or three runs.

Preceding a test run, a track-pan gage for scoop clearance, with yellow

paint applied to the leather strips, was placed in the bottom of the pan at right angles to the direction of travel. The scoop, in striking the leather, left a well defined impression from which it was possible to determine the clearance between the scoop and the pan. For the early runs at Rome, a wire gage was used instead of a leather gage, but it was discarded in favor of the leather because of the greater accuracy of the latter. Indirectly, the gage provided a check on the calculated immersion of the scoop in the water.

A series of 91 tests were made with this special testing outfit, and the data and calculations assembled formed the basis for the following conclusions:



A View of the Test Train in Action

1. Where the top of the track-pan was placed level with the top of the rail, some of the fittings of the standard scoop would at times ride heavily on the top angle of the pan, indicating that it is highly desirable to locate the pan far enough below the top of the rail to provide reasonable clearance between the scoop and the top angle of the pan.

2. The highest scooping efficiency, the greatest practical delivery of water into the tender, and the most uniform results at all speeds and depths of scoop immersions in the water are obtained if the top angles of the pan are placed inside and turned inward toward the center line of the pan, and with an open width between these angles of not more than 19 in., while the water level is maintained as far below the top of the pan as other limiting conditions will permit, and the depth of scoop immersion in the water is about 4 in.

3. The amount of water delivered into the tender is independent of the speed, and under the ideal conditions contemplated in these conclusions, with respect to the pan, the scoop setting and the water level, the efficiency falls off very little between speeds of 45 and 55 miles per hour. Above a speed of 55 miles per hour the efficiency drops more rapidly, even under favorable conditions.

4. Eight inches is the desirable depth of pan.

5. The track pan should be resurfaced whenever any portion is more than 3/4 in. higher than the standard position.

6. The scoop should be reset whenever the vertical setting checks less than 5 1/2 in. or more than 6 1/4 in. below the top of rail, and the center of the scoop mouthpiece checks more than 1/2 in. laterally from the center line of the track. The maintenance of the pan and the scoop within these limits and an allowance for a maximum vertical deflection of the scoop of 1/2 in., will insure that a standard clearance of 2 in. between the scoop and the bottom of the pan will be maintained.

The data on tests and the conclusions of the testing committee were reviewed subsequently at a meeting of representatives of all departments of the New York Central on all territories where track pans were located, and resulted in the following recommendations which have since been adopted as standard practice:

1. The tops of track-pans shall be one inch below the top of the track rail.

2. The water in the track-pans shall be maintained one inch below the top of the pan, or two inches below the top of the rail.

3. The setting of the scoop shall be a maximum of 6 in., and a minimum of 5 1/2 in. below the top of the track rail, which should provide a maximum immersion in the water of 4 in.

4. The maximum speed over track-pans shall be 50 miles per hour.

5. All pans installed in the future will be 8 in. deep, with an opening of 19 in. at the top and with the angles turned in or toward the center of the pan.

As there were several different types of pans in service at the time the above standards were adopted, it was arranged that when existing track pans are renewed or new installations made, they are to be of the new design, and that in the meantime adjustments will be made to the existing pans so that their tops will be one inch below the top of the rail, and the scoop when in the lowered or operating position will be six inches below the top of rail, which will give a four-inch immersion in the water, with the water level one inch below the top of the pan. By this arrangement, locomotives operating over different districts can all have the same standard scoop setting, and this in time can be increased to give greater immersion in the water when the eight-inch pans are installed at all locations.

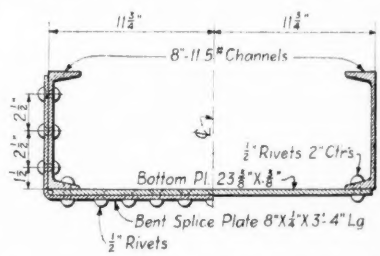
These adjustments, which in some cases required the lowering of the pans and in other cases, raising them, were completed in 1929, and the scoops adjusted accordingly. All new pans installed since 1929 were designed to meet the above requirements.

At the present time, the New York Central has 72 pans in service in 29 different locations. These vary from 1,400 ft., to 2,500 ft. in length, and are located on tangent track.

## Method of Supplying Water

The attachment of the water-supply piping to the pan creates quite a problem. The conventional scheme includes a connection to the bottom of the pan which must provide flexibility between the pan and the underground piping to allow for some movement of the track and the pan. Also, the allowable rate of flow of the water is quite limited, as otherwise much water will be wasted by overflowing the pan at the location of the inlet.

Some years ago, the New York Central developed the so-called side inlet which includes two castings, bolted to the sides of the pan, opposite each other. Each casting is provided with an oblique water passage, delivering water toward the center of the pan and longitudinally in the direction of traffic. This builds up a head of water that is higher




**Cross-Section of the Design of Track Pan Adopted as a Result of the Investigation**

in the center of the pan than at the sides without overflowing, which, together with the longitudinal discharge, accelerates the rate of flow along the pan and permits a higher rate of discharge. For these reasons, the side inlet offers decided advantages over the bottom inlet.

The two vertical pipes supplying water to the side inlets are fitted with flanged rubber joints which provide ample flexibility and have required no maintenance during several years of service. The conventional metallic sleeve expansion joint formerly used with the bottom inlet frequently stuck on account of corrosion and was expensive to maintain.

Showing How Marine Borers Have Damaged What Appear to be Well Treated Portions of a Pile

**An exposition of the habits of teredo and limnoria in their destructive action on wood submerged in salt or brackish waters and a discussion of the requisites for maximum protection for piles so exposed**

**By Dr. HERMANN VON SCHRENK**
**Consulting Timber Engineer,**
**St. Louis, Mo.**

# How Marine Borers Attack Creosoted Piles*

HOW and where do marine borers attack creosoted wood? I will enumerate these various points:

1. At unprotected spots such as cut surfaces; around bolt holes, and at points where wood has been abraided, exposing untreated wood. In other words, marine borers will quickly find any surface in a creocoted pile or timber which does not have a protective treatment of preservative.

2. Through knots. One of the chief reasons why many creosoted piles have been attacked by borers, is the fact that, particularly with wood like pine and fir, highly resinous knots and wood immediately surrounding such knots offer considerable resistance to the penetration of creosote. The borers work through the knot into the untreated wood in the pile, in which they then rapidly work up and down, resulting in the destruction of the pile as a whole.

3. Through points where there is little or no creosote in the outer part of the pile.

4. Where too little creosote or an improper preservative has been used.

When borers obtain entrance through unprotected wood, all that we can do is to see to it that there is no unprotected wood. When it is absolutely necessary to bore holes or frame creosoted pieces after treatment, the wood should be given a protective coating of creosote immediately after boring or cutting. Incidentally, one of the very best protective measures is to use a pile with a maximum amount of sap wood, for this, with careful treatment, will insure as deep a protective layer as possible. Small cuts in the surface will then remain in the creosoted layer. This will also hold true for surface abrasion. A timber which is penetrated only a quarter of an inch will be attached more readily when this quarter-inch shell is broken or abraided or handled roughly than a piece which has a penetration of three inches.

Coming to the question of knots, it has been found to be entirely practical to make a careful inspection of piles before treatment, and when resinous knots are present to bore them out, treat the piles and fill the bored holes either before or after treatment with tight-fitting heavily creosoted plugs. I have seen many piles so prepared and have found that when carefully and properly done, boring and plugging effectively resist the entrance of marine organisms.

The absence of creosote or insufficient creosote may be due to improper treatment, the presence of strips of inner bark or skin on the piles or water pockets which form as a result of steam seasoning. By improper treatment, I mean treatment of piles which had too much water in them at the time of treatment so that effective penetration was not secured or the penetration was irregular. The presence of strips of inner skin frequently prevents the penetration of the creosote into the wood immediately below the bark strip. Marine organisms readily find these vulnerable spots and through them gain entrance into the unprotected inner wood of the pile.

## Other Failures Few in Number

The formation of water pockets in piles which are treated green after extensive steaming has frequently been noted. These may involve small or large areas. The wood cells are completely filled with water, which resists the absorption of creosote so

*Abstracted from a paper presented before the annual convention of the American Wood-Preservers Association.

that when the pile is sectioned after treatment, numerous white spots extend from the outside into the pile. With reference to what I call "improper oil," we have all known cases where, instead of coal tar creosote, oils or materials other than pure coal tar creosote have been employed in the treatment of piles.

### No Deficiencies

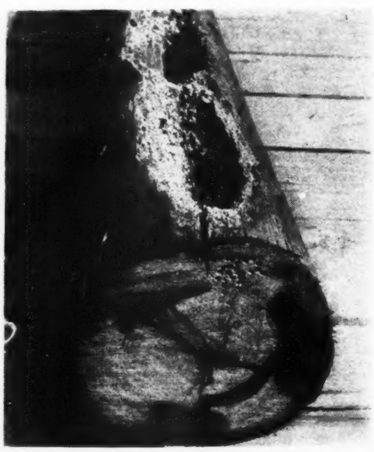
Occasionally there have been piles in which none of these deficiencies pointed to the reason for borer attack. There have been many piles which apparently were thoroughly penetrated and which apparently contained sufficient creosote which have, after a few years, shown the presence of teredo or limnoria. However, when one considers the total number of creosoted piles which have been in service, these cases are comparatively rare, at least until the piles have been in service for 20 years or more. It is difficult to say whether their lack of immunity to marine borer attack is due to the leaching out of the essential elements in the creosote or to the greater vigor of the organisms.

We know that if many of these marine forms are able to develop to a certain degree of maturity, they acquire increased vigor. The results obtained by attaching untreated bait pieces to creosoted pieces have shown that without the bait pieces, larvae are unable to attack creosoted wood, but that when they have reached their maturity in the bait pieces, they are often able to attack the creosoted pieces. The presence of bait pieces in sufficiently intimate contact with piles serving in a pier is, of course, rare. It is, however, given as one of the factors which may make it possible for borers to attack and destroy apparently-creosoted piles. This is particularly true of teredo.

### Precautions To Be Taken

In considering the treatment of piles as a protection against marine borers, the first point to be observed is that the pile with the highest percentage of sapwood (referring specifically to such woods as yellow pine, Douglas fir or other coniferous woods or hardwoods with varying quantities of sapwood) is the one in which the greatest protection is obtained, because it is possible to impregnate such a pile (and this applies also to timbers) with the thickest ring of preserved wood. In reconstruction work in Boston Harbor, we are now purchasing southern pine under specifications providing for a minimum of three inches of sapwood.

Best results will also be obtained when only thoroughly air-seasoned piles are treated. By so doing, one is assured that the creosote will penetrate not only equally but readily into all of the sapwood, providing, of course, that a sufficient quantity of oil is injected. The steaming of green piles frequently produces results which cannot be predicted, such as the formation of water pockets, possible internal checking and above all, unequal penetration. I realize that there are many heavily steamed piles that have given long service, but there are also records to the contrary. In the absence of dire necessity, therefore, one should apply preservative treatment only to air-seasoned piles and timbers.



A Treated Pile That Has Been Badly Damaged by Marine Borers

As for protection against decay, all boring, framing, boring out of knots, etc., should be done *before treatment,* and, where this is not always possible, all injuries to the creosoted layer should either be plugged or given a subsequent treatment. All piles for use in harbors subject to marine exposure should be treated with the Bethel or Full Cell process under the specifications of the American Wood-Preservers Association or the American Railway Engineering Association. The largest possible retention of the preservative should be aimed at in order to obtain maximum penetration and to fill the wood cells with creosote as completely as possible. I would like to see all piles, particularly those for use in southern waters, treated to "refusal." I contend that a retention of 20 lbs. of creosote to the cubic foot should be the minimum for piles for northern waters and that as one goes south, this amount should be increased to the greatest retention possible per cubic foot which can be obtained. The cost of the extra preservative will be more than returned in increased life.

Lastly, we come to the discussion as to the use of proper creosote. In spite of our long experience with creosoted piling, we have not yet come to a clear understanding of exactly what it is that cresote does to marine organisms. Does the presence of creosote act as a toxic substance, or is there a physical factor involved? Personally, I have come to the conclusion that there is a combination of both. It is for this reason that I so strongly favor using creosotes which have comparatively high amounts of high-boiling constituents. I have observed in late years that piles which have higher percentages of what might be called "sticky solids" seem to have a higher resistance to marine organisms, particularly limnoria. Furthermore, limnoria seem to avoid pitchy and resinous woods.

### Type of Creosote

As regards the characteristics of the creosote to be used, the Marine Piling committee of the National Research Council made the following observations in its 1924 report: "Treatment during the last 15 or 20 years has been conducted with heavier creosotes with lower naphthalene contents. When used by themselves, the various fractions of creosote showed marked differences. As pointed out in connection with the Forest Service experiments, the higher boiling or heavier fractions of the creosote seem to have the greater protective efficiency. To what extent this may be true when these fractions are present in actual creosotes is still doubtful, because, as indicated in the Norfolk piles, a very long service was obtained with creosote containing high percentages of low-boiling fractions."

Summing up, I have come to the conclusion, after making personal inspections of creosoted piles the world over, that if you obtain piles and timber with a wide sap ring, if you see to it that the piles are clean with no parts of bark adhering, if you air-season them properly and then treat them with as large a quantity of oil as it is possible to get into the wood, and if you use an oil with not too high a percentage of low-boiling constituents, there will be every guaranty of long service. I am making all estimates for wharf construction on an assumed average life of approximately 30 years. I believe this is conservative and that in all probability the service life will be much longer.

# Putting Safety Across

**Recognizing that interest in safety cannot be maintained, and safe practices themselves put across effectively by dull, uninteresting methods a roadmaster aroused renewed interest at safety meetings with papers by foremen and talks by invited speakers. Reduced casualties per million manhours from 11.6 in 1926 to 4.2 in 1934**

RECOGNIZING that interest in safe thinking and safe practices cannot be maintained to the highest degree by inherently uninteresting methods, or by methods which have become dull through repeated application, Subdivision E of the Susquehanna division of the Delaware & Hudson is working on another tack. Two years ago debates among the foremen held interest at a high pitch, while now safety papers prepared and presented by the men are maintaining keen interest in a subject which might otherwise grow tiresome.

After an Enthusiastic Safety Meeting on Subdivision E—(1) Oscar Surprenant, Roadmaster, (2) P. A. Reynolds, Secretary, Division Safety Committee, (3) H. B. Bachrach, Supervisor

Under the direction of its superintendent of safety, and with constant interest on the part of its officers, the maintenance of way department of the Delaware & Hudson has made an enviable record in recent years in inspiring its men to safe practices, and, as a direct result, in reducing reportable accidents and casualties. With the further aggressive stimulation afforded on Subdivision E by its roadmaster and its track supervisor, this subdivision has usually been well up in the lead in interest among its men and also in minimum accidents per million manhours of employment.

On this subdivision, the dominant thoughts in putting safety across with the men are (1), never to let the methods of presenting safety ideas and safe practices become a bore by protracted routine application, and (2), to give the men themselves the major responsibility for lively safety meetings. The latest innovation on the subdivision is to let the men (foremen, assistant foremen and trackmen) present papers of their own conception and preparation before the safety meetings. In other words, the men promulgate their own safe practices, suggest their own remedies for unsafe practices, and mete out commendation or criticism for action among their number. That this method has been taken hold of enthusiastically by the men and is proving effective is evidenced in a number of ways, the most important of which is the continuation of the enviable safety record of the subdivision, which shows a reduction in casualties per million manhours from 11.6 in 1926 to 4.2 in 1934.

The safety meetings are held once each month on company time, and consume most of the day. All foremen and assistant foremen are required to attend all of the meetings, and, in addition, compulsory attendance is rotated among the trackmen so that 15 are required to be at each meeting. A standing invitation makes it always possible for any other trackmen to attend if they desire. As a result, with only 20 foremen and assistant foremen on the subdivision, attendance at the meetings has ranged from 45 to as high as 70.

All papers presented at the meetings are prepared and submitted voluntarily, there being no assignments and not so much as the suggestion of subjects, other than the general understanding that they must be related to the general subject of safety. That there has been no dearth of papers is seen in the fact that from 12 to 15 papers are presented at each of the meetings. The diversity of subjects covered is illustrated by the following titles of papers submitted at a recent meeting.

Give Safety First the Right of Way
Working Up Enthusiasm on Safety First
A "Tip" on Safety
Safety Is an Education
You Are Your Brother's Keeper
Safety First and Always
Why Safety?
Don't Gamble With Safety
Safety Is Your Duty
We Must Have Safety First
Safety in Handling Track Tools and Equipment
Safety and High Water
Accident Prevention
Motor Car Accidents Are Preventable
Avoid Accidents Before They Happen
Safety Pays

These papers, from 200 to 1,000 words long, were, with a single exception, written by foremen and assistant foremen, some of whom had difficulty in reading and writing the English language only a few years ago. In some cases the authors had the assistance of their wives and American-educated children in penning their papers, but the ideas were entirely their own and in many cases entirely out of personal experience. In only one or two cases did the authors hesitate to read their own papers, and in these cases only because of difficulty in reading or enunciating the English language correctly. Ordinarily, there is little hesitency among the men who, with their past experience in debating practical maintenance of way subjects at their meetings, have gained ability in talking freely before their own group.

Furthermore, there is a distinct feeling of pride among those who present papers, which is stimulated by the encouraging attitude of the supervisory officers.

In effect, the safety meetings on this subdivision are the men's meetings, in spite of the fact that higher officers and other guests are usually present. In fact, to make the meetings appear even more entirely the work and responsibility of the men, the roadmaster, acting as chairman of the meetings, frequently steps aside after a few opening remarks and appoints one of the more able foremen in the group to act in his place. This has never failed to arouse a favorable reaction among the men, and, under the guidance of the roadmaster, has never detracted from the efficiency of the meetings.

While the foremen's papers form the basis for the meetings, remarks are always made by the secretary of the division safety committee, who presents a progress report on safety on the other parts of the division and seeks to rally enthusiasm and rival-

ry. In addition, there is always one guest speaker of local prominence. This latter feature, one of the highlights of the meetings, has never failed to create enthusiasm among the men. Thus far the meetings have been addressed by the mayor of the city, the chief of police, two congressmen, the commissioner of public safety, several local judges, the sheriff, the commissioner of public welfare, and several clergymen and aldermen.

That these meetings are not a mere uninteresting repetition of the story of safety, but have really accomplished results of benefit to the road and to the men themselves, is seen in a statement of one of the men. "Our meetings," he says, "have resulted in a reduction in both minor and reportable accidents. They have helped greatly to educate us, which has been of great help to us in improving conditions not only on the railroad, but in our own homes. They have created a better feeling between us and our supervisory officers, and have unquestionably resulted in a large saving in dollars and cents to our company."

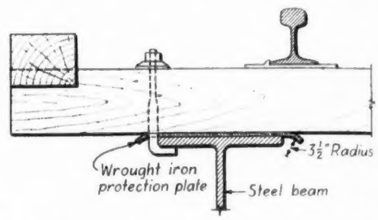
The meetings on Subdivision E, which are held in one of the larger rooms of the freighthouse at Schenectady, N. Y., the subdivision headquarters, are arranged for and carried out under the direction of the roadmaster of the subdivision, Oscar Surprenant, and his supervisor, H. B. Bachrach.

# Wrought Iron Plates Protect Spans from Brine

WHAT is probably the latest means adopted to protect the floor members of steel bridges from the corrosive action of brine drippings is the application of wrought iron protection plates to the top flanges of beams and girders. This practice should be distinguished from the use of wrought iron plates for the top cover plates of new girders or their application as new cover plates to the top flanges of old girders, in which cases the plates are used in the dual capacity of structural member and protecting sheath. In the practice described here, the corrosion-resisting material is used solely as a protection. Including installations where the plates are employed as structural members, wrought iron plates have been used by five different railways to minimize the effect of brine drippings on the top flanges of beams and girders. This method of protection is relatively inexpensive, since the amount of metal required for an individual structure has averaged only 5 to 5½ tons.

This form of protection has been employed on both new and old bridges, the most extensive application to new structures having been carried out by the Missouri Pacific, on which road wrought iron plates have been applied to the top flanges of girders and beams in 51 bridges to date. Although this form of protection has been employed thus far by this road only on new spans, it is its intention to extend the use to old bridges in the future. The plates are applied to the spans by company forces after they are delivered by the fabricator.

The plates used for the purpose of protection only are generally 3/16 in. thick and are furnished in lengths ranging from 27 to 32 ft., which are cut to fit the span lengths. They are ordered in widths sufficient to overhang the flanges of the beams or girders from 1½ to 2 in. on each side. The projecting edges are bent down at an angle of 30 deg. on each side so that they shed water and are




**Sketch Showing the Arrangement of Wrought Iron Protection Plates on a Beam Span Bridge.**

punched with square holes at a spacing that will provide for a hook bolt in every third tie on tangent track. The plates are held in place by spot welding them to the beam or girder flange at each end. The accompanying drawing shows the design employed by the Missouri Pacific.

The placing of the protection plates on girder flanges with cover plates has introduced no special problem on the Missouri Pacific, owing to the fact that it has been the practice of this road for some time to countersink the rivets (without chipping) for the purpose of simplifying the framing of bridge ties. As a result, rivet heads do not interfere with the placing of the wrought iron plates. In considering the application of the protection plates to old spans, it has been proposed to countersink the cover plate connection rivets. This, of course, involves redriving, but inasmuch as this work would be done in most cases only where the rivet heads have been badly corroded, the rivets should be redriven in any event.

In cases where it is necessary to overcome the difference in thickness of cover plates and build up to a uniform height at the top of rivet heads in girder flanges, creosoted wood filler strips with holes to accomodate rivet heads have been used.

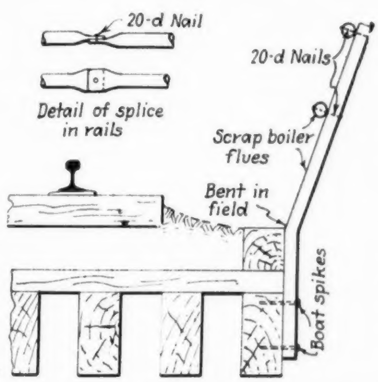
The primary reason for the adoption of this form of protection against the effects of brine drippings was the observed superiority of old wrought iron bridges in resisting corrosion, compared with the behavior of steel bridges subjected to similar conditions. The protection plates have not been in service long enough to permit of an accurate measure of their effectiveness, but observations made thus far have been sufficiently conclusive to warrant a considerable extension of this type of protection.

Installing Brine Protection Plates on a Beam Span Trestle near Fisk, Mo.

# Scrap Flues for Railings

INEXPENSIVE hand-rails are being constructed of scrap boiler flues on the Gulf, Mobile & Northern for use on ballast-deck timber trestles where sidewalks have not been provided but where operating conditions sometimes make it necessary for trainmen to walk along the guard timbers while trains are standing on the bridge.

The uprights or posts of the hand-rails consist of 5-ft. lengths of the flues fastened to the outside stringer at intervals of about 5 ft., and bent outward from a point near the top of the guard timber so that the tops of the posts will be in line at a dis-




Typical Details of the Scrap Flue Railings

tance of about 12 or 15 in. from the outer face of the guard timber and about 3 or 3½ ft. above its top. Each upright is fastened to the stringer by two ⅜-in. by 5-in. boat spikes located 2-in. and 12-in., from the lower end of the post.

The horizontal members of the hand-rails consist of two lines of flues fastened to the verticals at distances of 2 in. and 18 in., respectively, below their tops by means of a 60d nail at each intersection. The flues in the horizontals are fashioned into continuous lengths by means of lap joints which are formed by flattening the ends of the flues for a distance of about 3 in. and fastening them together with a 60d nail at each joint, the nails being clinched in such a manner that the points will not present a safety hazard. In order to minimize the possibility of persons running into the ends of the hand-rails, they are flared by locating the end posts several feet outside the other verticals. The handrails are given a coat of aluminum paint.

All work in connection with the construction of the hand-rails, including the forming of the members and the punching of the necessary holes, is done on the ground by a bridge carpenter and a laborer. Using a chisel and one of the track rails as an anvil, the flues are first cut into the required number of 5-ft. verticals. These members are punched with the necessary holes for the nails and boat spikes and are then bent by striking them forcibly against the rail at a distance of about 15 in. from the lower end. After the posts have been spiked into position on the bridge, additional forming may be necessary in order to obtain the desired alinement. While the verticals are set at approximately 5-ft. intervals no attempt is made to space them accurately, the chief concern being to place them so that their tops will be at the same elevation and so that they will line up with reasonable accuracy.

The flues for the horizontal members are used in the random lengths as received and are prepared by flattening their ends, again using one of the rails as an anvil, and then punching a hole in the center of the flattened area. Holes for the nails that are to hold the horizontals to the posts are not punched until the position of each member with reference to the posts can be determined. The horizontal members are applied progressively from one end of the bridge.

The function of these hand-rails is primarily psychological; their presence gives a sense of security because a trainman knows it will stop his fall if he should slip or lose his balance. Observation shows however, that the men who walk along the guard timbers rarely put their hands on the railing.

We are indebted for the information regarding this practice to L.P.O. Exley, chief engineer of the Gulf, Mobile & Northern.

## Uses Simple Device to Oil Rail Joints

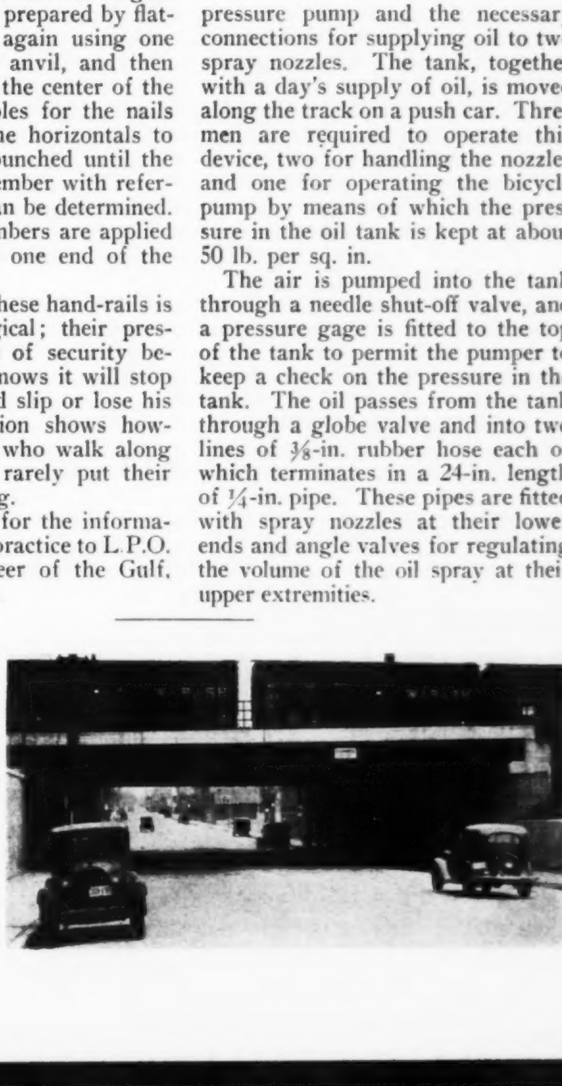
A DEVICE for oiling rail joints and fastenings which is said to be both effective and economical has been developed and is being used by the Boston & Maine. This oiler, which was originated by a track foreman on the B. & M., embodies the use of a cylindrical tank holding seven gallons which is fitted with a

The Track Oiling Device in Operation

pressure pump and the necessary connections for supplying oil to two spray nozzles. The tank, together with a day's supply of oil, is moved along the track on a push car. Three men are required to operate this device, two for handling the nozzles and one for operating the bicycle pump by means of which the pressure in the oil tank is kept at about 50 lb. per sq. in.

The air is pumped into the tank through a needle shut-off valve, and a pressure gage is fitted to the top of the tank to permit the pumper to keep a check on the pressure in the tank. The oil passes from the tank through a globe valve and into two lines of ⅜-in. rubber hose each of which terminates in a 24-in. length of ¼-in. pipe. These pipes are fitted with spray nozzles at their lower ends and angle valves for regulating the volume of the oil spray at their upper extremities.

Steel and Concrete Subway Structure at Burleigh Street, Milwaukee, Wis., on the C.M. St.P.&P.



# What's the Answer?

## Renewing a Single Failed Pile

*Where a single pile in a ballast-deck trestle fails, should it be redriven? Why? If not, how can it be replaced? If so, how should it be done?*

### Inserts a New Section

By H. AUSTILL
Bridge Engineer, Mobile & Ohio, St. Louis, Mo.

We use six-pile bents in ballast-deck trestles, and in cases of pile failure we remove the bracing and excavate around the failed pile until we reach perfectly sound timber, but not less than 3 ft. below the ground surface. We then cut the old pile off square with a saw. We next cut a new pile to exact length and if it happens to be a batter pile it is cut to exact bevel. It is then set up on the stub of the old pile and sprung into place under the cap. We bore two or more diagonal holes with an auger through the lower end of the new pile and into the old one (toe-nail fashion) and thus anchor the new pile to the old one with 3/4-in. or 7/8-in. drift bolts driven into the holes. The head of the new pile may be attached to the cap with straps and lag screws or with angle irons and lag screws. The bracing is then replaced. We repeat this method of replacement until not more than three of the original piles have been replaced.

### Redriving Not Economical

By ENGINEER MAINTENANCE OF WAY

Long experience in the maintenance of timber bridges of all types has shown that it is not economical to redrive one or more piles, or in some cases even several full bents, until the structure approaches the end of its useful life. This is particularly true of the ballast-deck type, owing to the expense involved in the removal of the deck plank, the shifting of the stringers, and of the cap if it is not feasible to drive the pile on a slant and then pull it into position beneath the cap.

When replacing one pile in a bent it is usually feasible to cut off the old timber just below the ground line where it is sound, then place a block about 3 ft. long, to give some ground bearing, and fit in a post of the necessary length in place of the defective pile.

The sway bracing is replaced and fastened securely to the new post to make it assume its full share of the load. When inserting this post, it is well to set jacks on each side and put sufficient strain on the cap to raise it slightly off of its bearing. When the post is in place the cap can be dropped back into place, thus making a tight fit and allowing for part of the settlement that is likely to occur in the structure.

### Better to Splice

By E. C. NEVILLE
Bridge and Building Master, Canadian National, Toronto, Ont.

It is much better and more economical to splice a failed pile than to drive a new one, unless the deck must be torn out in connection with other work. On the other hand, the outside piles can often be driven without disturbing the deck, and this is the best way, provided the bent is high enough, say 15 ft., to permit the new pile to be sprung under the cap. If the bent is lower, so that it is difficult to spring the pile into place, two piles, one on either side of the bent, can be driven and a short cross cap can be put on to support the main cap.

**Send your answers to any of the questions to the What's the Answer editor. He will welcome also any questions you wish to have discussed.**

### To Be Answered in November

1. *What methods should be employed to protect poles in telegraph and signal lines from fire when burning the right of way?*
2. *What means should be employed to insure that water barrels on bridges will not feeze during the winter? Who should be held responsible for caring for them?*
3. *What advantage, if any, is there in the use of a guard rail ahead of a facing-point switch in high-speed track? At what distance and on which side of the track should it be placed?*
4. *What attention should building forces take at this season to insure that skylights and ventilators are in proper condition for winter?*
5. *What action should be taken by the section forces at this season to insure proper drainage through culverts and in longitudinal ditches during next spring's rains?*
6. *What details should be included in a pumper's daily reports? Why? What use should be made of this information?*
7. *How late in the fall should general track surfacing be permitted? Why?*
8. *What are the advantages and disadvantages of applying locomotive fuel oil to those parts of steel bridges which are particularly subjected to accumulations of dirt and cinders? How frequently should it be applied, and by whom?*

If the failure is near the top of the pile, the top can be cut off and a corbel inserted between the cap and the pile. This method can be used for two or more piles, but in such cases the corbel should be sufficiently long to be continuous over all of the piles affected.

If the failure occurs at or near the ground line, the pile should be cut off low enough to obtain sound timber and another pile or a square timber spliced on. If failure has developed

2 or 3 ft. below the ground line, it is better to cut off the two adjoining piles above the ground level, double cap them and put in three square timber posts, making sure that they are well tied in with the remaining piles of the bent through the agency of the existing sway bracing.

### It Is False Economy

By L. G. Byrd
Supervisor of Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

It is false economy to replace a single pile in a ballast-deck trestle, since the preparatory work consumes as much time as is required if the entire bent is redriven, except perhaps where the failed pile is an outside one. Even here, however, unless the height is greater than 12 to 14 ft., the cap must be removed for driving.

Most failures of treated piles originate from lack of protection for the exposed surface of the cutoff. Where decay starts in the untreated wood at or near the center of the cutoff area, one may expect several piles in the bent to be affected, and sometimes all of them. Where this occurs, it is only necessary to cut the piles down and double-cap them. At this time, however, the cut surface should be thoroughly protected by several applications of hot creosote, a thin layer of coal-tar pitch and a layer of felt roofing material that has just been dipped in hot creosote.

Where the failure is more extensive and the pile must be replaced, the ground around the pile should be excavated deep enough to uncover sound wood. The sway braces are then removed and the drift bolt through the cap, if used, can be cut off with a hack saw. The pile is then sawed through at the bottom and removed. The part cut out is then replaced with a creosoted pile of suitable length, all exposed cut surfaces being protected with hot creosote, tar and felt in the manner described. The top of the pile should be anchored to the cap by means of angles and 3/4-in. bolts of suitable length. The bottom fastening should be made with 3/8-in. by 3-in. by 18-in. iron straps and bolts both above and below the joint. This method of replacement costs from $10 to $15, whereas the minimum cost of driving is from $60 to $75. When redriving outside piles the cost is somewhat less as it is not necessary to remove the deck because spring piles can be installed.

If the bent stands in water continuously, it may be cheaper and better to strengthen it by driving a pile on each side of the cap, removing the failed pile and supporting the cap either on a timber across the piles immediately below the cap, or on a post supported in the same manner between that level and the surface of the water. Where there are as many as four failed piles in a bent having a height of 18 ft. or more, in standing or running water, it is usually more desirable and economical to redrive the entire bent.

## Section Gang's Place in Laying Rail

*Should the section gang assist a rail gang when laying rail on its section? If so, in what ways?*

### Should Not Assist

By D. E. Gelwix
Division Engineer, St. Louis-San Francisco, Springfield, Mo.

If the rail is being laid as part of an extensive program, there will be no shortage of labor in the rail gang and its size will not be so limited that a greater number of men will be desirable for efficiency. Under such circumstances section gangs should not assist with the laying of the rail, even on their own sections. On the other hand, numerous tasks arise in connection with laying rail, such as finishing small jobs behind the rail gang and doing certain preparatory work in advance, which the roadmaster may see fit to assign to the section gang. These are jobs that can be done more efficiently by the smaller section gang than by the larger extra gang. The section foreman can also provide better supervision over these small jobs than would be possible under any other arrangement.

Furthermore, to tie up a section gang on rail laying for even the limited time it involves on his section causes him to fall behind in his regular section work. It is granted that the use of the section gang may sometimes increase the efficiency of the rail gang to some extent, if it assists in the laying of the rail, but the sacrifices it must make in other directions will more than offset the increased efficiency thus attained by the rail laying gang.

### Has No Place

By W. E. Tillett
Assistant Foreman, Chesapeake & Ohio, Maysville, Ky.

A section gang has no place as a part of a rail gang. In the first place, few section foremen or men have been trained to lay rail as a major operation. Second, if the rail gang is properly organized, the section gang cannot be made to fit into the organization. Third, a rail gang is normally on a section so short a time that the local gang does not get into step with the work of the larger gang and both gangs will become more or less disorganized if an attempt is made to use the section gang in this way.

A section gang can, however, go ahead of the rail gang and remove highway crossings or follow and replace them. It can inspect the ties to insure that they all have proper bearing and tamp any that do not. It can check to insure that no tie-plate shoulders have been left under the rail, for this sometimes happens even where the work is carefully supervised. In other words, while a section gang should never be incorporated in the rail gang, it can perform these and other tasks to advantage. Furthermore, a rail gang is usually on a section so short a time that the section work does not suffer by reason of this diversion of the gang from its regular work.

### Depends on Amount of Rails

By Everett L. Case
Extra-Gang Timekeeper, New York, Chicago & St. Louis, Buffalo, N.Y.

If the rail gang is large and is organized to lay rail in long stretches, it is impracticable to incorporate a section gang into the organization, particularly since such a gang is on any one section for only a few days. On the other hand, if only a mile or two of rail is to be laid, the rail gang will be small and will be expected to go back to do the surfacing and renew and space ties, which work is usually done by a following ballast gang in the larger operations.

In such event, the section gang may find a real place in the rail gang organization. Power tools, except a rail crane, will probably be lacking and the section men can be assigned to adzing or to setting the tie plugs and tending to the tie plates, distributing material, gaging or any other of the numerous tasks connected with laying rail. When the surfacing and tie renewals are started, this gang will find a similar place of usefulness in the larger gang.

The section gangs should, of course, receive their orders from the rail gang foreman, and should be responsible to him. After the rail has been laid and the extra gang goes back to space the ties, gage the rail and surface the track the section gangs will no longer be required.

# When to Drive Rivets by Hand

*When only a few rivets are to be replaced, should they be driven by hand? Under what conditions is it worth while to set up a compressor and use a pneumatic hammer? Why?*

## Prefers a Compressor

By J. E. Bernhardt
Bridge Engineer, Chicago & Eastern Illinois, Chicago

Where the rivets to be replaced are few in number fully accessible for hand driving they may be driven by this method. It has been my experience, however, that where only a few rivets must be replaced they are generally located in places where hand driving is extremely difficult. In fact, in many cases hand driving is almost impossible, especially if the rivets to be replaced are in important connections. I prefer to set up a compressor and use a pneumatic riveting hammer, even though there are only a few rivets to be replaced. The reason for this preference is that better rivets result than from hand driving. Where only a very few rivets require replacement, it may be advantageous to use tight-fitting bolts instead of rivets.

## Matter of Balancing Costs

By P. G. Lang, Jr.
Engineer of Bridges, Baltimore & Ohio, Baltimore, Md.

This question is analogous to many others which are continually arising in modern railway maintenance. Its solution is primarily a matter of balancing the cost of transporting pneumatic equipment and setting it up for operation, against the economies incident to its use. With the practically universal use of pneumatic devices for riveting, the appliances used for manual riveting, simple as they are, are becoming increasingly scarce and difficult to keep readily available. On the other hand, pneumatic appliances designed for other railway work than riveting are frequently adapted for operations of the latter type.

Such adaptation is facilitated by the extension of power-driven appliances into every branch of maintenance and construction. Air compressors for use in track work are an obvious necessity on all parts of any railway system and at present there are few points to which it is impracticable to transport such machines within a short time and at moderate cost.

While, on the larger projects, the use of pneumatic equipment is undeniably the logical procedure, an attempt to apply general rules to specific conditions, or to establish for the smaller jobs a line of demarcation between the maximum number of rivets for manual riveting and the minimum for pneumatic driving, is extremely difficult. Between the manual maximum and the pneumatic minimum there must lie a broad field in which it is necessary to determine each case on the basis of the peculiar conditions surrounding it, including the proximity and availability of equipment and the force suited to each class of work, and particularly the urgency of the work.

The following figures are offered from experience, as pertinent to the question:

| | Number of rivets |
|---|---|
| Manual riveting ordinarily most desirable | Up to 50 |
| Impossible to establish any general rule; each case to be decided on the basis of its own conditions | 50 to 100 |
| Use of pneumatic equipment usually most desirable | More than 100 |

While the foregoing figures are subject to modification as the conditions surrounding the individual cases may demand, they are believed to represent the outlines of this problem in as definite terms as it is possible to formulate.

# Provision for Fire Protection

*What provision should be made for fire protection and fire prevention at small stations?*

## Require Good Housekeeping

By Frank R. Judd
Engineer of Buildings, Illinois Central, Chicago

Small stations should be provided with fire extinguishers, water barrels and buckets for protection within the building. All of this equipment should be so placed that it will be readily accessible and kept in condition for use when needed. It should be inspected systematically to insure against failure when an emergency occurs. In addition to this equipment inside of the building, attention should be directed to the location of water hydrants in the near vicinity, provided a municipal or other supply of water under pressure is available, so that an ample supply of water can be obtained for use if the fire cannot be extinguished with the foregoing equipment.

Fire prevention depends mainly on good housekeeping, that is, on keeping the premises free from rubbish, debris and other inflammable substances. Neither interior nor exterior fire hazards should be tolerated. The next most important factor in fire prevention is knowledge that the fire extinguishing equipment is in its place and is ready for instant use. A small quantity of water or the intelligent use of a fire extinguisher at the start of a fire may be more effective than the work of an entire fire department five minutes later.

## Keep Equipment Ready

By H. M. Baker
Assistant Supervisor Bridges and Buildings, Missouri Pacific, Monroe, La.

Small stations should be provided with one or more water barrels, which should be kept filled at all times. They should be located for easy access and the way to them kept cleared. They should be fitted with a cover and a cone-shaped bucket should be attached to the under side of the cover in such a way that it will not become detached but can be easily and quickly removed for use. Both the barrel and the cover should be painted a bright red and stencilled "For Fire Use Only." Every station, whether large or small, should be equipped with fire extinguishers, placed on a shelf within easy reach. In addition, they should be provided with a 16-ft. ladder, which should be hung on brackets or pegs inside of the building, preferably in the freight room, when not in use. There should be regular and systematic inspection

to insure that this fire-fighting equipment is at all times ready for instant use.

Prevention of fires is most readily accomplished by good housekeeping. Shelves or lockers should be provided in the freight room for the storage of records, or a special record room can sometimes be built. In any event, records or loose papers should not be allowed to lay around but should be stored neatly on shelves. Neither should they be stored in the attic. If the building has electric lights the installation should be made by or under the direction of the electrical department and all connections and fixtures should receive regular inspection.

If oil-burning lamps are used for lighting, a small oil-storage house large enough to contain two or three two-gallon cans and a metal pan and shelf for cleaning the lamps should be placed 50 ft. or more from the station. Failing this, a large metal pan filled with sand, and a metal shelf can be located in the freight house, and all filling and cleaning of the lamps should be done here. Above all things, oily waste should not be placed in drawers, in lockers or on shelves, but should be kept in a metal container, or better yet burned either away from the building or in one of the stoves. All vegetation should be cleared to a distance of, say 10 ft. from around the building and outside of this a belt at least 50 ft. wide should be cut. If the building is covered with wood shingles, they should be removed and fire-resistant roofing applied.

### Agent Is Key Man

By E. C. Neville
Bridge and Building Master, Canadian National, Toronto, Ont.

Fire protection and fire prevention at small stations are not particularly difficult, but unfortunately the proper measures are frequently neglected, owing principally to lack of proper regulations and systematic inspection. These buildings are generally frame structures which are located away from public fire protection. For this reason fire extinguishers and water barrels provide the best form of protection available. Fire extinguishers approved by the Fire Underwriters afford the most valuable form of protection against small or incipient fires. They should be placed conveniently for instant use and should be inspected frequently and kept in good repair. Whether used or not they should be emptied and refilled at least once a year, and extra refills should be kept on hand. When used, they should be cleaned and recharged at once. A tag should be attached to the container showing the date of last recharge, and this should be checked by division officers every time they visit the station.

It is desirable to keep one or two water barrels in the freight house and at least one on the platform, each of which is equipped with two pails of such shape that they will not be used for other purposes. Care should be taken to insure that they are always filled. If oil is kept in the building and employees clean and fill lamps, a metal pan should be provided and a supply of clean dry sand kept on hand to smother oil fires. Also, a ladder should be provided to give access to the roof.

In large degree, fire prevention is a matter of good housekeeping. Something can be done in designing new buildings to decrease the fire hazard, but most of our small stations are not modern and lack these essentials of prevention, so that it is necessary that extra care be given to this feature. Defective heating appliances, flues, chimneys and roofs should be given special attention. Lockers and cupboards should be kept clean and oily waste and rags should be destroyed. Records should be kept neatly on shelves and smoking prohibited around them. In all of these items the agent is the key man and should be held responsible for seeing that the rules are obeyed. This does not relieve division officers of their responsibility for making frequent inspections, however.

# Repairing Broken Pipe Lines

*How does one go about making repairs to a broken discharge line? A suction line? Does the method differ in swampy ground?*

### Sleeve Gives Best Results

By J. P. Hanley
Water Service Inspector, Illinois Central, Chicago

It is assumed that the line in question is actually broken and is not leaking as a result of defective joints. In the latter case the repairs are usually made by excavating around the pipe and recalking the joint. If a discharge line is broken, the first operation is to shut off the water on both sides of the break and then uncover the pipe fully to expose the broken section. If the fracture is a short one or if it is circular, extending around the pipe, a fitting of the split-sleeve type is usually sufficient to cover the damaged section. This fitting comes in two identical sections which can be slipped over the pipe and bolted together. After the bolts are tightened the ends should be calked with jute and lead and then recalked in the usual manner.

If the fracture is in the form of a split which extends over a considerable length of the pipe, a sleeve will seldom be long enough to cover it. In this case it is the usual practice to cut out the damaged section and insert a smooth section of new pipe, that is, one without bell and spigot, using a sleeve at each end of this section in the manner already described.

If a suction line is laid with cast iron pipe, the procedure will be the same as for a discharge line. Suction lines are usually laid with wrought iron pipe. Probably the best method of making repairs in this case is to weld the pipe, provided it is not shattered and welding equipment is available.

The method of making repairs when the line is laid in swampy ground does not differ from that adapted for the same work elsewhere. However, difficulty may be encountered in keeping water away from the work and the expense may be quite high for excavating, sheeting, bracing and pumping, as well as for making the necessary repairs.

### Weld Suction Lines

By Supervisor of Water Service

In some cases, repairs can be made to a broken discharge line with comparative ease. In general, such lines are laid with cast iron pipe, in which event, unless the break is extensive, a split sleeve can be used. Obviously, the first and most necessary action in case of a break is to shut off the water by closing valves on both sides of the break. The pipe can then be uncovered and, if the break is a local one, the sleeve can be slipped around the pipe and bolted to a tight fit. The ends should then be protected against leakage in the same manner that a joint is filled with oakum or other filler, poured with lead and calked.

If the pipe is shattered or split longitudinally or if the break is so extensive that it cannot be covered by a sleeve, it will be necessary to cut

out the broken section and insert an equal length of sound pipe. The ends of the broken pipe and of the new piece should be trimmed to a neat fit. When the new section is in position it can be secured by using a sleeve at each end of the new section in the manner already described. In some cases two or more sections of pipe may be broken. In this event they should be removed and full lengths of pipe used to replace them.

Suction lines are generally laid with wrought iron pipe. If the break is small it can sometimes be repaired by welding. Extreme care must be used, however, to avoid moisture at the point where the welding is to be done. If the break is so extensive that it is necessary to remove an entire section, the adjacent sections can be cut off back of the threaded portion and a new section welded in. If several sections are involved all but the last section can be replaced with threaded pipe and a new section welded in to fill the gap. Oftentimes it is necessary to use two short sections of pipe to fill the gap, because a full length of pipe will not be long enough after the adjacent sections have been cut back of the threaded portions.

The fact that the pipe may be laid in swampy ground will not affect the method of making the repairs but only adds to the difficulty of restoring the pipe to service. When making leaded joints or doing welding it is of prime importance to keep the surfaces involved dry. This may be extremely difficult and may require expensive sheeting and large-capacity pumps, but in other respects the repairs should be carried out in the manner described.

# New Joints When Welding Rails?

*Should new joint bars be applied when welding rail ends? Why? If so, when should they be applied? Why?*

## Reformed Bars Better

By William Elmer
Assistant Engineer, Pennsylvania, Philadelphia, Pa.

Applying new joint bars to rails that have been battered enough to require welding will not correct the condition which will be found to exist. If the running surface of the rail head is down, the fishing surfaces under the head and on the base will also be worn. Assuming that new bars fit properly when the rail was new, such bars could not possibly fill up the worn and battered fishing surfaces at the time welding is required. For this reason, reformed bars having sufficient crown to compensate for the wear should be used, or shims should be applied between the rail and the joint bar.

When two new rails are brought together in the track ready for splicing, there is only a slight chance that they came from the rolls close together. It is just as likely that one rail was rolled shortly before the rolls were redressed and the other shortly after. Consequently, the fishing spaces may vary several thousandths of an inch, so that when the joint bar is drawn to a snug bearing on one rail end, there may be no contact between the bar and the fishing surfaces under the head and on the base of the other rail. The same conditions may occur between the opposite bar of the pair and the other side of the rail webs, and it will be little short of a miracle if all eight bearing points, or surfaces, of the two rails make a tight fit with any joint.

While it is true that there is a slope of 1:4, or of 14 deg., in the fishing surfaces, it must also be remembered that joint bars are stiff and offer strong resistance against horizontal bending, for which reason there must be a length of several inches under one rail head which usually is not supported. If this loose end happens to be the leaving end of the rail on a multiple track line, it is not so bad, since the rail with the tight-fitting joint will receive the blow. If the bolts are tightened periodically there will eventually be an improvement in the fit and a better bearing for both rail ends, but this condition cannot last long, since the receiving end will soon batter down and the surface of the leaving rail will roll out, by which time the fit of the bars will be worse and no amount of tightening of the bolts can take up the wear on the fishing surfaces.

Further study will reveal other departures from perfect joint conditions. The thickness of the two rail heads will seldom be exactly the same, so that if all eight points do have a bearing, one rail head will stand slightly above the other. Fortunately, this is easy to correct, since the high rail can be ground down to the level of the low rail. A much better track will result if this grinding is done immediately after the rail is laid, and it is imperative that this be done when laying cropped rail. When grinding the head in this manner, it is important to produce a gentle slope for the runoff. To accommodate modern speeds this slope should not exceed 0.003 to 0.005 in. per inch. If steeper, the wheels will leave the rail when moving down the slope and strike a heavy blow on the level or sloping surface on the other side of the joint or at the end of the runoff.

It is evident from the foregoing that new bars are not adapted for use in connection with welding rail ends and that even reformed bars may have their shortcomings. It would be foolish, however, to neglect the opportunity to get some of the lost motion out of the joint before it is welded. For this reason we should use the best appliances available until some process is developed that will insure a satisfactory fit at every joint, or until the joints in track are eliminated. It is scarcely necessary to add that when changing bars preparatory to welding, track conditions should be given careful study and that the joint ties should be renewed and the ballast cleaned, where necessary, and the joints surfaced.

The changing of the joint bars should be completed three or four weeks in advance of the welding. This will give time for two or three tightenings of the bolts and allow mill scale or rust to work out. By this time a good bearing of solid metal should be assured.

## Joints Should Be Fixed

By C. B. Bronson
Inspecting Engineer, New York Central, New York

To me the proposition is the reverse of the question, namely, how much welding will be necessary if you fix your joints first. It is a fundamental fact that the condition of the joint, as it affects the riding qualities of the track, is too often overlooked, and sole reliance is placed on welding as the corrective. It is beginning to be recognized that the first thing is to fix the fit between the rail and the joint bars. To do this, however, new bars are necessary in relatively few cases. The fishing area is always worn most at the middle of the joint, both on the bar and on the rail, for which reason some compensation must be applied. Either old bars reformed with a central crown on the head—even new bars for this purpose should be crowned—or the use of head shims with the old bars are effective ways of obtaining tightness of fit in the zone where it is most needed, namely, in the central

third or quarter portion of the bar.

It is surprising what a marked improvement will be noted in the riding qualities of joints treated by either of these methods, or by any other that will overcome the hinge effect that comes from worn bars. This is merely the result of getting the component parts of the joint assembly to act in unison. In nearly every case, the decision to weld should be held in abeyance until the joints are treated in this manner.

When this is done the apparent batter may be so reduced that the condition at the rail ends can be corrected by a small amount of surface grinding at a relatively small cost, leaving a satisfactory surface across the joint gap. Grinding down the humps across the bolt holes will often bring the real batter down to 1/64 in. or less. Too much surface grinding should be guarded against, however, in the effort to attain what is supposed to be perfection, since this not only wastes time, but more important, it removes the valuable cold-rolled bearing surface. I believe that we have been paying too much attention to the attainment of perfection of the surface of the rail by grinding or welding and that we have been overlooking the fundamental difficulty, which is the hinge action which results from loss of metal on the fishing surfaces, thus causing worn and loose joint bars. While the foregoing does not answer the question directly, it is obvious from what has been said that the joint bars should be changed or attended to in some way before attempting to weld the rail ends.

If it is decided to build up the ends, the correction of the joint bar condition should be made far enough in advance of the welding to insure that they will reach the proper degree of fit before the welding is done, and this is usually after the second tightening of the bolts. That is, two weeks or a month should elapse between the application of the bars or shims and the welding. In general, it is quite essential that at least the joint ties be surfaced as the rail ends are invariably brought to a much higher level after the attention to or changes in the joint bars.

The foregoing discussion should not be construed as an argument against welding. It is merely to emphasize the point that we should start at the foundation of the trouble when mapping out a program. Furthermore, the full potential benefit from welding cannot be realized unless the joints are first taken care of by methods which will result in smooth action throughout the assembly.

# Getting Across a Washout

*Is it preferable to crib across a washout with ties or to drive a temporary trestle? Why? If the former, is it practicable to salvage the ties when the filling is done?*

## Track Worth $1,000 an Hour

By E. M. Grime

Engineer Water Service, Northern Pacific, St. Paul, Minn.

If the main tracks of a trunk-line railway are worth $1.000 an hour, as operating men have often stated, the use of the quickest means available to get traffic over a washout is justified. If the pile driver is 100 miles away, but ties or other timber are available and the conditions will permit cribbing, the track can sometimes be restored before it would be possible to get the driver on the scene. The only question then is whether cribbing can be constructed to carry trains safely. If it can, this method is certainly advisable.

What can be done in one case may be wholly impracticable in another, however, for which reason there is no place where the exercise of good judgment by the first maintenance men to arrive on the scene of the trouble is more valuable to his employers. Obviously, if the opening is long and deep, or there is an arch culvert or other structure to be spanned and a waterway to be maintained, it is seldom possible to get across the washout without driving a trestle. On the other hand, cribbing is usually the best method where the hole is not more than 6 to 8 ft. deep, and is indispensible for a long washout where a depth of only 1 to 3 ft. of embankment has been destroyed, and no filling material is available.

## Many Details to Consider

By K. H. Hanger

Engineer Maintenance of Way, Missouri-Kansas-Texas, Dallas, Tex.

There are so many details and local conditions that are related to repairing a washout that it is difficult to give a direct answer to these questions. The nature of the washout, whether there is a good firm base for cribbing, whether there is an appreciable current, whether the base is dry and whether the hole is shallow enough to permit cribbing, all of these factors affect the decision as to the method to be pursued. The length, as well as the depth, of the washout and the availibility of material and machines for bridging, or of ties for cribbing, will also greatly affect the course of action.

It is desirable, of course, to get across a washout in the quickest safe manner. If the washed place is of appreciable depth and length and the materials and equipment for both methods are equally available, the temporary trestle is prefereable.

Under the foregoing conditions, in most instances work can be gotten under way in a shorter time for the construction of a temporary trestle than for the construction of a temporary crib, since the amount of water and the current through the washout are of much less importance than in crib construction. A temporary trestle is a more stable structure than cribbing, and when the filling is completed it is not practicable to salvage all of the material used in the cribs, for which reason some of it must of necessity be left in the embankment. This is not desirable in places subject to wash. When a temporary trestle has been constructed, only the piles need be left, and they will be much less likely to cause subsequent trouble than a considerable amount of cribbing. Obviously, it will be possible to construct temporary trestles in many places that are washed out where cribbing would be entirely out of the question.

## Depends on Depth

By C. R. Wright

District Engineer, New York, Chicago & St. Louis, Frankfort, Ind.

The method to be employed in supporting the track across a washout will depend on the depth of the wash and the kind of material available to build the support while making the new grade. Ordinarily, if the wash is not deeper than, say, 5 ft. ties or other available timber can be used to advantage to crib the track. If the timber is placed carefully, very little of it need be lost, provided the track is filled just enough to permit the timber to be released. If the fill is made with ballast or other loose material, all or practically all, of the timber can be recovered. Where crossties are used, two cribs should be built, one under each rail, with the ties projecting to the outside of the track. This will require more

ties, but, if necessary, they can be pulled out and moved ahead as the filling progresses.

When conditions approach normal, and gravel or other filling material becomes available, the cribbing should be removed, so far as practicable. It may not be practicable to salvage all of the ties, but no timber should be permitted to remain closer than about three feet below the ties, and if it can all be removed without too much interference with traffic it is most desirable to do so. This is not so much to recover the timber as to avoid leaving material in the fill which may decay and cause settlement of the embankment.

# Branch-Line Tie Renewals

*Should the standard for tie renewals be less rigid for branch lines than for main lines? Why? If so, how should it compare with that for main lines?*

## Conditions Are Different

By L. A. Rape
Extra Foreman, Baltimore & Ohio, Wampum, Pa.

Because of the marked difference in conditions on main and branch lines it is plain that main-line standards would be extravagant on branch lines. This applies to ties as well as to other phases of the property. Crossties are graded by size, the quality being the same for all grades, grades 2 and 3 being adapted for branches, while grades 4 and 5 should be used in main lines. The reason for this is that the smaller ties will give as long, or longer, life under branch-line traffic as the larger ties in main lines.

About the same proportion of ties should fail from decay in both classes of track. There are many other causes of failure, however, and not a few ties which, because of the higher speeds and larger number of trains cannot be left in main-line tracks, would, if they were in branch-line tracks, be good for several years, especially if tie plates were used. In some cases, owing to differences in ballast, or if the branch is unballasted, tie renewals may be heavier on a branch line than on the main line.

## Can Be Less Rigid

By C. S. Kirkpatrick
Chief Engineer, Missouri Pacific Lines, Houston, Tex.

In making forecasts for tie renewals on branch lines for the ensuing year, which is generally done by an assigned inspector or by the roadmaster, consideration is always given to the amount of traffic, whether the line is ballasted or unballasted, the weight of the power in service, the speeds that are maintained and other factors. Ties which will not last a year on a heavy-traffic main line may give more than a year of service on a branch line. While a safe tie condition is always necessary, fewer ties are required on branches and the standard for renewals is not and should not be as rigid as on main lines.

In the maintenance of branch lines, the same considerations apply to line and surface. The problem resolves into keeping the railway safe for operation in every respect, taking into consideration the amount of traffic handled. When this is done, speed requirements can be maintained and the cost of maintenance can be held to the minimum.

## Puts Safety First

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

In every phase of maintenance, safety must be given first consideration. For this reason, when it comes to setting a standard for tie renewals, the volume and character of the traffic, the speed of trains and the general condition of the track and roadbed are important factors bearing on what that standard shall be. In no case, however, can the matter of cost be ignored, but it must be balanced with the other factors.

Every trackman experienced in the maintenance of both main and branch lines is aware that a tie which cannot be expected to last a year in a busy main line may sometimes be good for two or more years in a branch-line track, provided its approaching failure is not due to general decay, because of the lighter service it is called on to perform. Furthermore, it is the universal experience that many ties, other than those affected by general decay, that have all of the external indications of being ready to come out, if allowed to remain in service, will last one year longer and in some cases two years.

During the last six years we have all learned much that we did not know previously about the conservation of ties. It is obvious now that in many cases we were extravagant in our use of ties. On the other hand, these lessons had already been learned, in part at least, by supervisors and foremen on branch lines where tie allowances had seldom been as liberal as on main lines.

Keeping these facts in mind and remembering that the effect of traffic is less severe on branch lines than on main lines, it is obvious that the standards of renewal can be somewhat lower than on a main line. This does not mean, however, that a broken or decayed tie or one that is badly shattered should be left in the track. It must not be overlooked, too, that tie plates are now being used extensively on branches, as well as on main lines and that they tend to increase the life of the ties, not infrequently making a tie safe for a year or two longer than if it had not been plated.

## Can Relax Requirements

By Henry Becker
Section Foreman, St. Louis-San Francisco, Rush Tower, Mo.

My experience indicates that the standard for tie renewals does not need to be as rigid on branch as on main lines. Trains are fewer, they run at lower speeds, passenger equipment is generally lighter and, while the same freight cars are operated over both main lines and branches, freight trains generally have less cars. It is clear, therefore, that ties in branch-line tracks are subject to far lighter service than on high-speed or heavy-traffic main lines.

Safety is the paramount consideration in all maintenance work, for which reason a rotten tie, a tie that is broken under the rail or one that is so badly shattered that it no longer has any bearing value, should be removed from a branch line track, just as from a main line. On the other hand, there are many instances where ties that are approaching failure from other causes cannot be left in high-speed tracks; yet these ties would be perfectly safe, sometimes for several years, in a branch line where the service requirements are much lighter.

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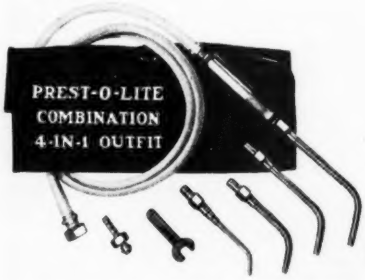
Most Northerly Bridge—The Tanana River bridge of the Alaska Railroad at Nenana, Alaska, is the most northerly railway bridge being at latitude 64 deg. 30 min. north. The Kuskulana gorge bridge, 61 deg. 30 min. north, is the northernmost bridge on the nearby Copper River & Northwestern.

# New and Improved Devices

## New Prest-O-Lite Combination Outfits

A NEW "4-in-1" outfit and a plumber's outfit have been added to the line of Prest-O-Lite equipment for soldering, brazing and heating that is being offered to the railways by the Oxweld Railroad Service Company, Chicago. The Prest-O-Lite 4-in-1 outfit is constructed to the same standard as the "5-in-1" outfit previously placed on the market, but is intended for use in work where the more complete equipment is not required. It differs from the 5-in-1 outfit in that four stems instead of five (the soldering iron is omitted), and a durable, water-proof




The New Prest-O-Lite "4-in-1" Outfit

fabric carrying case, instead of the heavier metal case, are offered at a somewhat lower price consistent with the difference in equipment.

The four stems cover: Fine soldering, for exacting heating operations on delicate instruments; light soldering, brazing and heating, as for making soldered wire splices; medium soldering, brazing and heating for average open work; and heavy soldering, where the torch must furnish a volume of heat sufficient for bending rods, straightening dented sheet metal parts and other repair work.

It is said that the Prest-O-Lite 4-in-1 outfit can be used in any position in places that are hard to reach, that they provide an intense accurately-focused flame, that the stems are accurately machined and that the individual mixer for each stem automatically maintains the proportions of acetylene and air. The handles are made of a non-heat-conducting material.

Two Prest-O-Lite plumbers outfits are now being offered. Outfit No. 1 embraces a torch with a needle valve, 15 ft. of hose and a 5-lb. pressure regulator, while outfit No. 2 includes an extra stem. The mixer in the torch is designed to insure correct proportions of acetylene and air and the needle valve affords a convenient means of turning the gas on and off. Uniform working pressure is insured by the pressure regulator.

## New Rail Lubricator

THE Q & C Company, New York, has put on the market an automatic rail and flange lubricator, which is relatively simple in design and operation, and which is said to operate effectively and economically at all seasons of the year with one grade of grease. The new unit, which is designed to be located entirely above the ground, consists essentially of a multiple-orifice nozzle plate, which is bolted to the gage side of the rail; a rocker arm and ratchet assembly located on the outside of the rail, which is actuated by the treads of passing wheels; and a grease supply tank or cylinder, containing agitating paddles, and a pump which forces the grease through a heavy rubber hose to the nozzle plate. The rocker arm and ratchet assembly effect the operation of both the grease-agitating paddles and the pump through a sturdy flexible shaft connection.

A number of special features are incorporated in the several parts of the new machine. The nozzle plate, which is approximately 16 in. long and does not project above the under side of the rail head, has fourteen 1/8 in. orifices along its top edge, which direct the grease upward against the gage face of the rail head where it can be picked up by passing wheel flanges. The rocker arm, which presents a ramped surface to the wheel treads, is faced with live rubber to eliminate shocks to the operating mechanism; and the operating rod between the ratchet and the grease cylinder is provided with two universal joints to insure flexibility of movement and minimum wear.

The grease cylinder, which is essentially a section of seamless steel tubing 10 3/4 in. in diameter and 24 in. long, affording capacity for 70 lbs. of grease, is provided with a series of four paddles on a central shaft, which not only force the grease forward to the pump at the lower front end of the cylinder, but also agitate it automatically with the passage of trains to keep it in a free-moving condition at all times, regardless of temperature. A disc cam at the forward end of the paddle shaft actuates the pump plunger as the shaft is turned, forcing the grease to the nozzle plate and up against the side of the rail head. Charges of grease are put into the supply tank from above at its outer end, and are moved forward until the tank is full by turning the agitating paddles by a hand crank.

The discharge of grease from the nozzle plate can be adjusted at two points in the machine. One of these adjustments is in the length of travel of the rocker arm, which controls the number of strokes of the piston of the grease pump, and the other is in

A Typical Installation of the New Q & C Automatic Rail and Flange Lubricator

the length of the piston stroke itself. It is said that the pump is capable of putting a pressure of 400 lb. on the grease in the supply line, which will insure its delivery uniformly through all of the nozzle orifices, regardless of low temperatures. Through the capacity of the pump and the ability to regulate its output, it is said that the machine can be used to supply two nozzle plates, if desired (on opposite rails), so as to lubricate the high rails of both right- and left-hand curves ahead of the machine.

A Bridge on the Alaska Railroad

# News of the Month . . .


## Caskie Appointed to I.C.C. Replacing Farrell

The United States Senate, on August 20, approved the appointment of Marion M. Caskie of Alabama as a member of the Interstate Commission, to succeed Patrick J. Farrell, who has been appointed assistant chief counsel of the Commission. Mr. Caskie, who is 45 years old, has been identified with the transportation industry in various ways for a number of years. At the time of his recent appointment he was connected with the Waterman Steamship interests.

## Eastman Announces Changes in Staff

As the result of a vacancy and of changes in the character of the work planned for the current year, Joseph B. Eastman, federal co-ordinator of transportation has announced a number of changes in the personnel of his staff. The changes in organization are being made primarily with the objective of getting the railroads to adopt policies advocated by the co-ordinator following two years of intensive research. In the Section of Transportation Service the work will be divided between two co-directors, namely, John C. Emery, formerly of the editorial staff of the Railway Age, and Joseph L. White, who has been assistant to the director of the Division of Transportation Loans, Federal Emergency Administration of Public Works. In addition, N. D. Ballantine, heretofore assistant director, has been promoted to the position of director of the Section of Car Pooling, which was left vacant by the recent resignation of O. C. Castle.

## Rail Employment in July

As of the middle of July, the Class I steam railways of the United States had 1,018,025 employees on their payrolls, an increase of 3,177 as compared with the previous month but a decrease of 30,792 as compared with the corresponding month of 1934, according to preliminary figures issued by the Interstate Commerce Commission. The index of railway employment, however, which is based on the 1923-25 average taken as 100, was 57.0 in July, or higher than for any month since August, 1934. In comparison with both the previous month and with July, 1934, the maintenance of way group showed the smallest decrease, the number of employees in this group being 0.85 per cent smaller than in July, 1934, the next lowest decrease being 1.15 per cent in the number of executives, officials and staff assistants and the largest decrease being 4.70 per cent in the number of employees in the maintenance of equipment and stores group. As compared with June, 1935, the number of maintenance of way employees showed an increase of 2.18 per cent, while all other groups showed decreases except the professional, clerical and general group and the transportation group (other than train, engine and yard), which showed increases of 0.03 per cent and 0.15 per cent, respectively.

## Michigan Gets Funds for Grade Separation

President Roosevelt has approved an allotment of $6,765,197 of works program funds previously apportioned by the Secretary of Agriculture to Michigan for the elimination of hazards at grade crossings in 27 counties in the state. This allotment covers the entire amount earmarked for that state from the $200,000,000 fund set aside for grade crossing projects in the 48 states. The grade elimination program in Michigan will involve the reconstruction of 7 existing grade separation structures, the construction of 26 new grade separation structures and the elimination of 22 grade crossings by the relocation of highways and streets.

## Congress Passes Motor Carrier Bill

A bill providing for the regulation by the Interstate Commerce Commission of busses and trucks operating in interstate commerce has been passed by both houses of Congress and signed by the President. The bill was passed by the Senate on April 16 and approved by the House of Representatives, with some amendments, on August 1 and was sent to the President for his signature after the Senate had accepted the House amendments on August 5. The bill is mainly in the form originally recommended by Joseph B. Eastman, federal co-ordinator of transportation. It vests jurisdiction over interstate motor carriers in the Interstate Commerce Commission, assisted by joint boards of state representatives. The bill provides for certificates of public convenience and necessity for common carriers and permits to operate for contract carriers. In regulating common carriers the commission is authorized to fix rates and to establish reasonable requirements with respect to continuous and adequate service, the transportation of baggage and express, uniform systems of accounts, records and reports, the preservation of records, qualifications and maximum hours of service of employees, and safety of operation and equipment. For contract carriers the commission is authorized to approve or disapprove rates and to establish requirements with respect to accounts, records and reports, qualifications and maximum hours of service of employees, and safety of operation and equipment.

## Congress Passes Railroad Pension Act

A railroad retirement bill which is somewhat similar to the law enacted in 1934 but minus some of the features found objectionable by the supreme court, was passed by both houses of Congress on August 19. The bill proposes to pay to the employees when they retire at the age of 65 or after 30 years of service, pensions based on their compensation when in service and their years of service, with a maximum of $120 a month. Although it is not required that employees retire at 65 years, those who do not retire at this age are penalized by reducing their annuity by one-fifteenth for each year they continue in service beyond the age of 65. Annuity payments are to be determined by multiplying the years of service up to 30 by 2 per cent of the first $50 of average monthly compensation, 1½ per cent of the next $100 and 1 per cent of the next $150. A separate tax bill provides for the levying of taxes against the railroads and their employees for the purpose of paying the pension. This bill provides for income taxes of 4 per cent of the railroad's payrolls, 2 per cent of which comes from the employees, and 6 per cent by employee representatives connected with labor organizations recognized under the railroad labor act.

## Suggests Subsidized Experiment in Rail Fares

A government-financed experiment in reduced passenger fares has been suggested by John A. Hastings, a former member of the New York State Senate. Under the plan a fare of $1 would be established as the regular train fare for any distance beyond approximately 50 miles but within the scope of one railroad system and a fare of $3 would be set up for express or limited service over a single railroad system, on the theory that such fares would greatly stimulate passenger traffic and make it profitable. To save the railroads from possible losses while experimenting with the plan, it is proposed to establish a government corporation with a capital stock of $500,000,000 to pay to each railroad periodically the difference between the "postalized" rate and the regular rate last fixed by the company with the approval of the Interstate Commerce Commission. In commenting on the plan, Co-ordinator Eastman said that, although he was opposed to government subsidy of private undertakings, "the railroad passenger situation is now such and general conditions are such that a financial experiment in reduced passenger fares has much to commend it." He added the view, however, that it would be unwise to embark upon the plan without most careful consideration and that, since the plan disregards the item of expense, it is doubtful if the railroads would be willing to embark upon such an experiment.

# Association News

## Bridge and Building Association

The program for the convention, which will be held at the Hotel Stevens, Chicago, on October 15-17, is rapidly approaching completion. Most of the committees have completed their work and forwarded their reports to the secretary, while the others will be completed within a few days.

## Roadmasters Association

Arrangements are rapidly approaching completion for the fiftieth annual convention at the Stevens hotel, Chicago, on September 17-19, the program for which follows:

(All sessions on Chicago Daylight Saving Time—one hour ahead of Central Standard Time)

**Tuesday Morning, Sept. 17**

Convention called to order 10:00 a.m.

Invocation.

Opening address by Harry G. Taylor, chairman, Western Association of Railway Executives, Chicago.

Greetings from the American Railway Engineering Association, by R. H. Ford, president (assistant chief engineer, C.R.I. & P.), Chicago.

Greetings from the American Railway Bridge and Building Association, by T. H. Strate, vice-president (division engineer, C.M.St.P. & P.), Chicago.

Address by President Charles W. Baldridge, assistant engineer, A.T. & S.F., Chicago.

Appointment of special committees.

Report of Committee on Recent Developments in the Organization of Track Forces, W. C. Pruett, chairman; general foreman, M-K-T Lines, Muskogee, Okla.

**Tuesday Afternoon**
(2:00 p.m.)

Address on The Place of the Railroads in Today's Transportation Picture, by G. S. Fanning, chief engineer, Erie, Cleveland, Ohio.

Report of Committee on The Handling and Distribution of Ties from the Treating Plant or Storage Yard to the Point of Use, E. L. Banion, chairman; roadmaster, A.T. & S.F., Independence, Kan.

Address on Educating Track Men in Efficient Maintenance Methods, by C. J. Geyer, engineer maintenance of way, C. & O., Richmond, Va.

Adjournment to visit exhibit of the Track Supply Association.

**Evening Session**
(7:30 p.m.)

(Celebrating the Association's 50th Anniversary)

50 Years' Work—A review of the association's activities, by George E. Boyd, associate editor, *Railway Engineering and Maintenance*, Chicago.

A Half Century's Development in Track Maintenance—an address by B. E. Haley, general roadmaster, A.C.L., Lakeland, Fla.

The Track Supply Manufacturer's Contribution—an address by R. L. Cairncross, western manager, National Lock Washer Company, Chicago.

The Association's Contribution to Railway Efficiency, by John V. Neubert, chief engineer maintenance of way, N.Y.C.

**Wednesday Morning, Sept. 18**
(9:30 a.m.)

Report of Committee on The Maintenance of Tracks in Terminals—Organization Materials, Methods, A. H. Peterson, chairman; roadmaster, C.M.St.P. & P.

Address on Railway Problems of Today, by S. T. Bledsoe, president, A.T. & S.F. Railway System, Chicago.

Report of Committee on The Maintenance, Reclamation and Repair of Frogs, Switches, Railroad Crossings and Other Track Materials and the Economic Limitation of Such Practices, Walter Constance, chairman; supervisor of reclamation, C. & O., Barboursville, W. Va.

**Wednesday Afternoon**
(2:00 p.m.)

Address on Looking to the Future in Maintenance, by L. Yager, chief engineer, N.P., St. Paul, Minn.

Question Box—At which questions submitted by members will be presented for discussion.

Adjournment to visit exhibit of the Track Supply Association.

**Wednesday Evening**
(6:30 p.m.)

Annual dinner—Guests of Track Supply Association.

**Thursday Morning, Sept. 19**
(9:30 a.m.)

Report of Committee on Ballasting and Surfacing Track—Equipment, Organization and Methods, John J. Clutz, chairman; supervisor, Penna., Trenton, N.J.

Business session. Election of officers, selection of 1936 convention city, etc.

**Thursday Afternoon**
12:50 p.m.

Leave LaSalle street station on N.Y.C. train for Indiana Harbor, Ind., to visit rail and track fastening mills of the Inland Steel Company.

## Track Supply Association

A total of 47 companies have taken membership to date in the Track Supply Association, 37 of which have arranged to exhibit, taking 58 spaces, while several firms are still negotiating for membership and exhibit space. The exhibit already assured exceeds that of last year, when 38 companies took membership, 34 of which presented exhibits. The companies which have arranged for membership to date, including those published in our July issue, are as follows:

**Exhibiting Members**

Air Reduction Sales Company, New York.
American Fork & Hoe Company, Cleveland, Ohio.
Austin-Western Company, Aurora, Illinois.
Barco Manufacturing Company, Chicago.
Buda Company, Chicago.
Creepcheck Company, Inc., New York.
Duff-Norton Manufacturing Company, Pittsburgh, Pa.
Electric Tamper & Equipment Company, Ludington, Mich.
Fairbanks Morse & Company, Chicago.
Fairmont Railway Motors, Inc., Fairmont, Minn.
Illinois Malleable Iron Company, Chicago.
Ingersoll Rand Company, New York.
O. F. Jordan Company, East Chicago, Ind.
Kalamazoo Railway Supply Company, Kalamazoo, Mich.
Lundie Engineering Corporation, New York.
Maintenance Equipment Company, Chicago.
Mall Tool Company, Chicago.
Morden Frog & Crossing Works, Chicago.
Nordberg Manufacturing Company, Milwaukee, Wis.
Northwestern Motor Company, Eau Claire, Wis.
Norton Company, Worcester, Mass.
Oxweld Railroad Service Company, New York.
P & M Company, Chicago.
Pettibone-Mulliken Company, Chicago.
Pocket List of Railroad Officials, New York.
Positive Rail Anchor Company, Marion, Ind.
Q & C Company, New York.
Rail Joint Company, New York.
*Railway Engineering and Maintenance*, Chicago.
Railway Purchases & Stores, Chicago.
Railway Trackwork Company, Philadelphia, Pa.
Ramapo Ajax Corporation, New York.
Republic Steel Corporation, Youngstown, Ohio.
Sellers Manufacturing Company, Chicago.
Templeton, Kenly & Company, Ltd., Chicago.
Toncan Culvert Manufacturers Association, Youngstown, Ohio.
Woodings Forge & Tool Company, Verona, Pa.

**Non-Exhibiting Members**

American Steel & Wire Company, Chicago.
Blatchford Corporation, Chicago.
Chicago Pneumatic Tool Company, New York.
Cleveland Tractor Company, Cleveland.
Cullen-Friestedt Company, Chicago.
Eaton Manufacturing Company, Cleveland.
Hubbard & Company, Pittsburgh, Pa.
Inland Steel Company, Chicago.
National Lock Washer, Newark, N.J.
A. P. De Sanno & Son, Inc., Philadelphia, Pa,
Warren Tool Corp., Warren, Ohio.

## American Railway Engineering Association

The first formal report on the joint investigation of the causes of internal fissures in rails has been published in Bulletin No. 376 of the association which has just been mailed to the members. This report contains the tentative conclusions that have been arrived at as the result of the four years investigation, which has been conducted under the supervision of H. F. Moore, research professor of engineering materials at the University of Illinois, together with a committee representing both the railways and the rail manufacturers.

The Association of American Railways

has authorized Division IV, Engineering to publish a pamphlet containing all of the pertinent specifications and recommended practices in the Manual of the A.R.E.A. relating to steel and concrete bridges and bridge work in order that this information may be made readily available to engineers, contractors and vendors of the materials.

Four committees held meetings in August, and five committees will meet in September for the purpose of rounding out their reports for the next convention. The committees meeting last month were those on Rail, on August 8, and on Rules and Organization, on August 23, both at Chicago; the Committee on Masonry, on August 14 and 15, and the Committee on Waterproofing, on August 15 and 16, at New York.

The committees scheduled to hold meetings in September, all in Chicago, are Maintenance of Way Work Equipment, September 17 and 18; Track, September 18; Economics of Railway Labor, September 19; and Water Service, Sanitation and Fire Protection, September 22; while a meeting of the sub-committee chairmen of the Committee on Waterways and Harbors will be held on September 5, and a meeting of the entire committee on September 16. In addition, the General Committee of the Engineering Division, which includes five representatives each of the A.R.E.A., the Signal section and the Electrical section will meet at Chicago on September 15.

A test party, under the direction of Chairman A. N. Talbot of the Committee on Stresses in Track, is scheduled to start work in September on field tests of track of the Delaware, Lackawanna & Western and the Delaware & Hudson, work on the latter railroad to include tests of the installations of butt-welded rails.

## International Railway Maintenance Club

Thirty members, in addition to a number of guests, were present at the first fall meeting of the International Railway Maintenance Club, which was held at the Royal Connaught hotel, Hamilton, Ontario, on August 8. The meeting was addressed by C. B. Bronson, inspecting engineer of the New York Central, on the subject "What Are We Doing With Rails."

The next meeting of the club has been set tentatively for the second or third Thursday in November, at the Hotel Statler, Buffalo, N. Y.

## Wood Preservers Association

The executive committee has selected H. R. Duncan, a member of the executive committee, for second vice-president, filling the vacancy resulting from the death of F. C. Shepherd. Mr. Duncan is superintendent of timber preservation, C.B. & Q., Galesburg, Ill. The executive committee has also appointed M. F. Jaeger a member of the executive committee to fill the vacancy created by the promotion of Mr. Duncan. Mr. Jaeger is manager of the Port Reading, N.J., treating plant of the Reading-C.R.R. of N. J.

President Mattos has called a meeting of the executive committee to be held in Chicago in October to complete plans for the convention which will be held in Memphis, Tenn., next January.

# Personal Mention

## General

**R. S. Claar,** right of way and real estate agent of the Minneapolis, St. Paul and Sault Ste. Marie, who was formerly in the engineering department of that road, has been appointed real estate and land commissioner in connection with a reorganization of the land, right of way and real estate departments.

**William J. Harahan,** formerly chief engineer of the Illinois Central, who was elected president of the Chesapeake & Ohio and the Pere Marquette on July 23, was elected also to the presidency of a third Van Swerigen road, the New York, Chicago & St. Louis, at a meeting of the latter's board of directors on July 30. In all three capacities Mr. Harahan succeeds the late John J. Bernet. A biographical sketch of Mr. Harahan's railway career, together with his photograph, were published in *Railway Engineering and Maintenance* for August page 470.

## Engineering

**Manuel Oyarzabal** has been appointed division engineer of the Puebla division of the National Railways of Mexico, with with headquarters at Puebla, Pue.

**C. H. Tusler,** assistant engineer on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Miles City, Mont., has been promoted to division engineer of the Iowa and Dakota division, with headquarters at Mason City, Ia., succeeding **W. H. Wuerth,** who has been transferred to the Iowa division, with headquarters at Marion, Ia. Mr. Wuerth relieves **H. B. Christianson,** who has been transferred to the Trans-Missouri division, with headquarters at Miles City, to replace **W. A. Ring,** who goes to the Hastings and Dakota division, with headquarters at Aberdeen, S. D., to succeed **H. C. Blake,** who has been assigned to other duties.

**F. B. Wilcox,** whose promotion to assistant division engineer on the Pennsylvania division of the New York Central, with headquarters at Jersey Shore, Pa., was noted in the August issue, was born on September 2, 1892, at Parishville, N.Y. Mr. Wilcox began his railroad career as a chainman on the St. Lawrence division of the New York Central at Oswego, N.Y., on January 8, 1917, and on May 16 of that same year was promoted to rodman, with the same headquarters. On April 16, 1919, he was further advanced to transitman at the same point, and on July 26, 1920, he was transferred to Toledo, Ohio. On October 15, 1920, Mr. Wilcox was transferred to Syracuse, N.Y., and on March 1, 1922, he was promoted to assistant supervisor of track, with headquarters at Batavia, N.Y. On May 1 of that year he resumed the position of transitman at Syracuse, and on September 22, 1925, he was again promoted to assistant supervisor of track, with headquarters at Batavia, which position he was holding at the time of his recent promotion to assistant division engineer.

**F. J. Hoffman,** general maintenance inspector of the Chicago Great Western, with headquarters at Chicago, has been appointed division engineer of the Illinois-Iowa division, with headquarters at Oelwein, Iowa, succeeding **F. U. Mayhew,** assigned to other duties. Mr. Hoffman was born on September 22, 1890, at Mather, Wis. He received his education at the University of Wisconsin and entered the service of the Wisconsin Valley Electric Railroad in January, 1912, serving as a chainman and rodman until July 1, 1912, when he went with the Great Western as a rodman. From August, 1917, to July, 1918, Mr. Hoffman served as an inspector and assistant engineer on the Northern Pacific. In July, 1918, he re-entered the service of the Great Western as an assistant engineer at Des Moines, Iowa, being promoted on October 1, 1919, to supervisor of buildings and bridges, with headquarters at Clarion, Iowa. On March 15, 1925, he was further advanced to division engineer, with the same headquarters, serving alternately in that position and as assistant division engineer until November 1, 1931, when he was made roadmaster, with headquarters at St. Joseph, Mo. On September 1, 1932, he was made an instrumentman at Chicago, being promoted to engineer of surveys with the same headquarters on January 1, 1933. On September 1, 1934, he was appointed general maintenance inspector, which position he held until his recent promotion.

## Track

**H. W. Swartz,** acting supervisor on the Baltimore division of the Pennsylvania, and during the past month acting supervisor on the Williamsport division, has been appointed supervisor on the Cleveland division.

**T. R. Clevenger,** assistant engineer on the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Bellefontaine, Ohio, has been promoted to track supervisor on the Peoria & Eastern (part of the Big Four), with headquarters at Indianapolis, Ind., succeeding **S. Clinesmith.**

**C. F. Longerbeam** has been appointed acting roadmaster on the Kansas-St. Louis division of the Chicago, Rock Island & Pacific, with headquarters at Topeka, Kan., succeeding **H. O. Sinsabaugh,** who has been granted a leave of absence because of injuries suffered in an accident. **C. M. Webb,** a track inspector, has been apopinted roadmaster on the Oklahoma division, with headquarters at El Reno, Okla., succeeding **Dave Bogue,** whose death is noted elsewhere.

**Andrew Olson,** whose retirement as supervisor of track on the New York Central, with headquarters at Clearfield, Pa., was noted in the August issue, was born on October 28, 1873, in Sweden. He began his railway career on the New York Central on November 28, 1893, as

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a laborer at Olanta, Pa., and was promoted to section foreman on June 3, 1899. He was promoted to general foreman at Mahaffey, Pa., on May 25, 1906, and on August 1, 1911, he was advanced to supervisor of track, with the same headquarters. On September 1, 1931, Mr. Olson was transferred to Clearfield, Pa., where he was located at the time of his recent retirement.

**William C. Sheehan,** whose promotion to supervisor of track on the Lehigh Valley, with headquarters at Jersey City, N.J., was noted in the August issue, was born on October 5, 1898, at Jersey City. Mr. Sheehan was graduated from Dickinson High School, Jersey City, in 1915, and entered railway service as a timekeeper on the Lehigh Valley on June 16, 1915. On May 1, 1917, he was promoted to extra gang foreman and on April 1, 1926, was promoted to assistant supervisor of track, which position he was holding at the time of his recent promotion to supervisor of track.

**G. E. Steudel** has been appointed assistant supervisor of track on the St. Lawrence division of the New York Central, with headquarters at Watertown, N.Y. **A. S. Williams** has been appointed assistant supervisor of track on the St. Lawrence division, with headquarters at Carthage, N.Y. **A. G. Berg** has been appointed assistant supervisor of track on the Pennsylvania division, with headquarters at Clearfield, Pa. **D. W. Johnston** has been appointed assistant supervisor of track on the Eastern division, with headquarters at Brewster, N.Y., succeeding **M. J. Murphy,** who has been retired on pension.

**Ben Hagar,** assistant roadmaster on the Chicago & North Western, who has been promoted to roadmaster at Fond du Lac, Wis., as announced in the August issue, was born on October 22, 1889, at Harvard, Ill. Mr. Hagar first entered the service of the Chicago & North Western in 1905, serving as a laborer during the summer months until 1907. From 1909 until 1914, he was employed by the government as a postal clerk and in January, 1915, he returned to the C. & N.W. as a section laborer, being appointed a roadmaster's clerk on November 1, 1921. On March 12, 1923, he was promoted to assistant section foreman at Harvard, Ill., being advanced to section foreman at Bristol, Wis., on April 1, 1924. In December, 1925, he was transferred to Harvard, where he remained until June 20, 1929, when he was promoted to assistant roadmaster. On August 1, 1929, he was appointed supervisor of gatemen and flagmen at Chicago, and in September, 1934, he was made acting roadmaster, with headquarters at Harvard. On February 8, 1935, Mr. Hagar was appointed assistant roadmaster at Adams, Wis., where he remained until his recent promotion to roadmaster with headquarters at Fond du Lac.

**W. N. Skelton,** whose retirement as supervisor of track on the Syracuse division of the New York Central, with headquarters at Syracuse, N.Y., was noted in the August issue, was born in England on October 22, 1864. He began his railway career as a laborer on the New York Central in April, 1895, and was promoted to section foreman in May, 1898, with headquarters at Churchville, N.Y. In April, 1901, he was advanced to assistant supervisor of track, with headquarters at Batavia, N.Y., and in June, 1903, he was appointed acting supervisor of track, with the same headquarters. In May, 1905, Mr. Skelton was promoted to supervisor of track on the Mohawk division, with headquarters at Oneida, N.Y., and on April 1, 1910, he was transferred to Utica, N.Y. On April 1, 1916, he was transferred to the St. Lawrence division, with headquarters at Remsen, N.Y., and on October 1, 1917, he was transferred to Syracuse, where he was located at the time of his retirement.

**William E. Carnes,** whose promotion to supervisor of track of the New York Central, with headquarters at Clearfield, Pa., was noted in the August issue, was born on August 7, 1885, at Rome, N.Y. He received his higher education at the University of Wisconsin and began his railway career on May 18, 1903, as a file clerk on the New York Central, being made a chainman in the engineering department in June, 1906. He held the positions of chainman and rodman at various points from this date until February, 1912, when he left the service of the railroad for four years. Mr. Carnes re-entered the service of the New York Central on January 1, 1916, as a draftsman, and on September 11 of that year was promoted to transitman. On July 26, 1917, he was further advanced to assistant engineer at Oswego, N.Y., and on March 10, 1919, he was appointed assistant supervisor of track, with the same headquarters. On July 1, 1923, he was promoted to assistant division engineer of the Syracuse division, with headquarters at Syracuse, N.Y., and on October 16, 1931, he was transferred to Jersey Shore, Pa., where he was located at the time of his recent promotion to supervisor of track at Clearfield.

## Bridge and Building

**E. F. McClintock,** master carpenter on the Maryland division of the Pennsylvania, has been appointed master carpenter on the Wilkes-Barre division.

**W. B. Burke,** whose promotion to supervisor of bridges and buildings on the River division of the New York Central, with headquarters at Weehawken, N.J., was noted in the August issue, was born on January 8, 1881, at Lyons, N.Y. Mr. Burke started his railway career as a laborer on the New York Central in April, 1897, and was made a bridgeman on the Mohawk division on November 23, 1900. On April 18, 1906, he was promoted to bridge foreman on the same division, and later held this position at Albany, N.Y., until July 3, 1912, when he was promoted to general bridge foreman. On January 1, 1918, he was advanced to assistant supervisor of bridges and buildings with headquarters at Albany, where he was located at the time of his recent promotion to supervisor of bridges and buildings.

## Obituary

**Dave Bogue,** roadmaster on the Oklahoma division of the Chicago, Rock Island & Pacific, with headquarters at El Reno, Okla., died suddenly at Oklahoma City, Okla., on July 20.

**Frank C. Shepherd,** consulting engineer of the Boston & Maine, with headquarters at Boston, Mass., died on August 6 at his home in Chestnut Hill, Boston. Mr. Shepherd was born at Gloucester, Mass., on December 31, 1870, and was graduated from the Massachusetts Institute of

Frank C. Shepherd

Technology in 1892. He first entered railroad engineering work in 1902 as a resident engineer on the Grand Central Terminal improvements of the New York Central & Hudson River (now New York Central). He became construction engineer of the Boston & Maine in April, 1912, and served successively as engineer of construction, valuation engineer, principal assistant engineer, assistant chief engineer, chief constructing engineer, and in April, 1927, he was promoted to consulting engineer. Mr. Shepherd was chairman of the Committee on Wood Preservation of the American Railway Engineering Association, second vice-president and member of the executive committee of the American Wood Preservers' Association and a past president of the New England Railroad Club. He was also active in the affairs of several other technical societies.

**Gustav Lindenthal,** distinguished engineer and bridge builder, died at his home in Metuchen, N.Y., on July 31 at the age of 85. Mr. Lindenthal was born in Brunn, Austria, and was educated in Polytechnic schools in Brunn and Vienna. After serving in engineering capacities on railroads in Austria and Switzerland, he came to America in 1874, and was employed by the Keystone Bridge Company. For two years (1879-81) he was bridge engineer of the Atlantic & Great Western, now a part of the Erie. In 1890, he opened an office as consulting engineer in New York City. He was a member of the board of engineers for the Pennsylvania Railroad Tunnels under the Hudson river at New York (1902-04) and later was chief engineer of the New York Connecting Railroad, the chief feature of which is the Hell Gate bridge.

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# Supply Trade News

## General

The offices of the **Lundie Engineering Corporation** have been moved to 19 West Fiftieth street, New York.

**The Taylor-Wharton Iron & Steel Company,** High Bridge, N.J., will hereafter operate directly and in its own name the business of its wholly-owned subsidiary, **William Wharton, Jr. & Company, Inc.,** Easton, Pa.

**The Air Reduction Sales Company,** New York, has moved its Portland, Ore., headquarters from Third and Glisan streets to 13 Northwest Fourth avenue to provide increased space and demonstration facilities for its products. The company has also established new offices for supplies at 336 Spring street, N. W., in Atlanta, Ga., and at 18-20 North Cheyenne avenue, in Tulsa, Okla.

The **A. M. Byers Company,** Pittsburgh, Pa., has expanded its activities to include the manufacture and sale of steel pipe. Several years ago this company completed a modern wrought iron mill at Ambridge, Pa., for manufacturing genuine wrought iron under its new process. Following this, operations were further expanded to include the reintroduction of a wide range of wrought iron products, including plates, sheets, merchant bars, angles, structurals and forging billets. The third step in broadening the sales and manufacturing activities is the maufacture and sale of steel pipe, in addition to its wrought iron pipe.

### Proposed Merger of Inland Steel and Ryerson

A plan for the acquisition of Joseph T. Ryerson & Son, Inc., by the Inland Steel Company has been agreed upon by the chief executives of the two companies and will be submitted to stockholders of both companies for approval. The merger contemplates the operation of the Ryerson Company under its present name and management as a wholly-owned subsidiary of the Inland Steel Company. Edward L. Ryerson, Jr., is to be active with the Inland Company as one of its chief executive officers and three members of the Ryerson board of directors will become members of the Inland board. The amalgamation brings together the warehousing and distributing facilities of the Ryerson Company and the manufacturing and fabricating facilities of the Inland Steel Company. According to a statement issued by L. A. Block, chairman, and P. D. Block, president, of the Inland Steel Company and Edward L. Ryerson, Jr., president, and Edward D. Graff, vice-president, of the Ryerson Company, the amalgamation is of interest to both parties inasmuch as 75 per cent of the various steel products marketed by the Ryerson Company through its 10 large warehouses in the central west and east can be produced by in the plants of the Inland Company.

## Personal

**J. R. C. Hintz** has been appointed railway sales division manager, with headquarters at Detroit, Mich., in charge of sales to railways of paints manufactured by the **Detroit Graphite Company,** Detroit, and car finishes manufactured by **Valentine & Company,** New York.

**James R. Fitzpatrick** has been appointed director of sales of the Technical division of the **Algoma Plywood & Veneer Co.,** with headquarters for sales, research and engineering service at 228 North LaSalle street, Chicago. For the last 12 years Mr. Fitzpatrick has been vice-president in charge of sales for the Haskelite Manufacturing Corporation.

**R. J. Wysor,** vice-president in charge of operations of the **Republic Steel Corporation,** Youngstown, Ohio, has been elected executive vice-president and general manager to succeed **Ben F. Fairless,** who has resigned to go with the **United States Steel Corporation. C. M. White,** assistant vice-president, has been elected vice-president in charge of operations to succeed Mr. Wysor.

**William J. Hammond,** traffic manager of the **Inland Steel Company,** Chicago, has been promoted to vice-president in charge of railroad sales to succeed, **Charles R. Robinson,** who has been elected first vice-president and general

William J. Hammond

manager of sales as noted in the July issue. Mr. Hammond began his business career in 1901 as a clerk in the freight office of the Illinois Central at Chicago and held various positions with that road until 1911, when he was appointed contracting freight agent. In the following year he left that road to take a similar position with the Union Pacific, being appointed traveling freight agent in 1913 and eastern car service agent in 1917. Mr. Hammond entered the employ of the Inland Steel Company in 1918, as assistant traffic manager, and in 1926 he was promoted to traffic manager, which position he was holding until his recent election as vice-president.

**Edwin E. Boehne,** manager of the sales department of the International Creosoting & Construction Co., Galveston, Tex., died suddenly in Denver, Colo., on August 12. Mr. Boehne was born on September 24, 1877, at Woodville, Ill. Early in his business career, Mr. Boehne was connected with the Wood Preserving plant of the Union Pacific at Laramie, Wyo. He entered the service of the International Creosoting & Construction Co. in January, 1907, and served continuously with

Edwin E. Boehne

this company until his death. He served as cashier and assistant manager of the plant department at Beaumont, Tex., until July, 1911, when he was transferred to the lumber and sales department at Galveston. He was appointed manager of the sales department in January, 1916.

## Trade Publications

**Fairbanks Valves**—This is the title of a 52-page illustrated catalogue, designated as catalogue No. 21, which has been issued by the Fairbanks Company, New York. This catalogue, which contains many illustrations printed in two colors, lists and describes the complete line of bronze and iron valves and dart unions manufactured by this company.

**Facts About Welded Pipe**—This is the title of an informative, well-illustrated, 24-page booklet issued by the Air Reduction Sales Company, New York, which discusses the practical advantages and economies of the Aircowelding process of making pipe joints in various types of heating, plumbing and power installations. The booklet also discusses Aircobrazing and includes specifications for various types of welded pipe installations.

**Steel Bearing Piles**—This is the title of a 78-page illustrated booklet recently published by the Carnegie Steel Company, Pittsburgh, Pa., which contains comprehensive data concerning this company's CBP sections (steel bearing piles). The subject matter of the booklet includes sections on bearing capacities, driving formulas, driving phenomena, engineering and design, the spacing of piles, splices for piles, caps for piles, driving equipment, installation, handling and driving, test data, bearing values, sustaining values, capacities of CBP sections, elements and safe loads of sections, test methods, corrosion data, corrosion resistance and protection. In addition, the booklet contains drawings and photographs on typical installations and a set of suggested specifications for steel bearing piles.

# Hitting 2 birds with 1 shot

## The October issue will do double duty.

**1** —It will carry the story of the Roadmasters Convention to every subscriber.

**2** —*In addition,* an advance edition containing all of the committee reports to be presented at the meeting will be placed in the hands of every railway man attending the convention.

The sales messages of advertisers using this issue will, therefore, do double duty, reaching the man at the convention and also the man at home—at no additional cost.

This is an added service rendered to and appreciated by those attending the convention. It is equally valuable to the manufacturer.

*Forms close September 9*

**Maintenance Mike says: The Roadmasters Convention and Exhibit must be worth while. I overheard the Chief tell our division engineer the other day that four of the "big shot" committees of Engineers will hold meetings during the convention. He said he is going to be there. My roadmaster is, too. They're both live men, who know what's worth while.**

**RAILWAY ENGINEERING AND MAINTENANCE IS READ BY MAINTENANCE OFFICERS OF ALL RANKS**

## ALPHABETICAL INDEX TO ADVERTISERS